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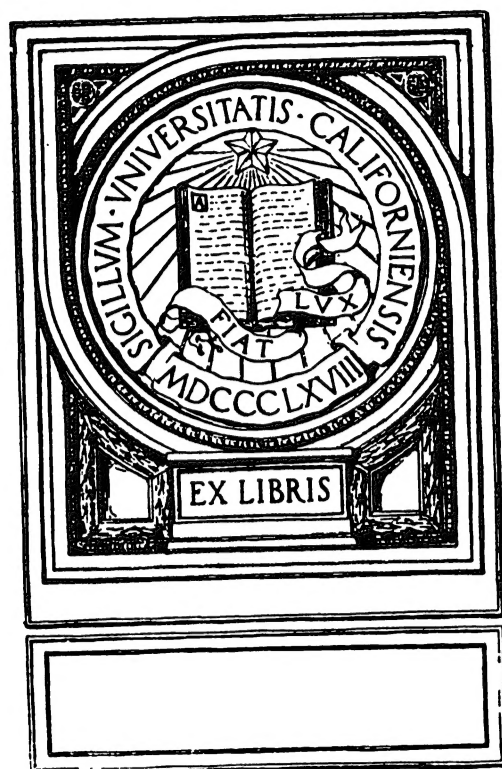
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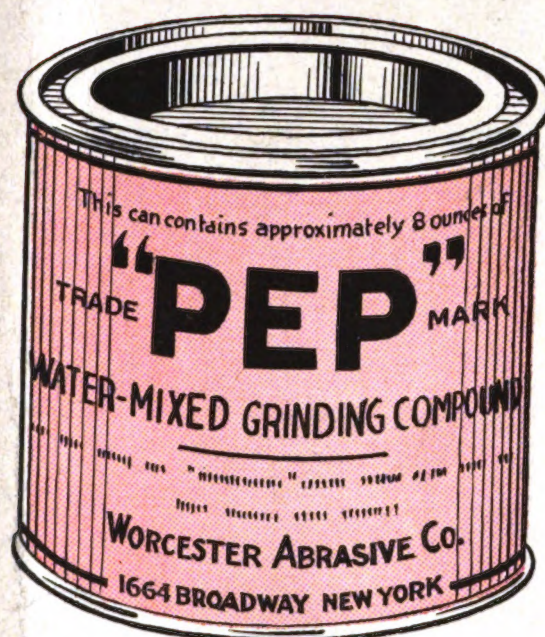
AUTOMOBILE JOURNAL

DEVOTED TO
OWNERS OF NEW AND USED CARS DEALERS AND REPAIRERS

VOL. ⁶⁹LXIV.

PAWTUCKET, R. I., AUGUST, 1921.

NO. 1.



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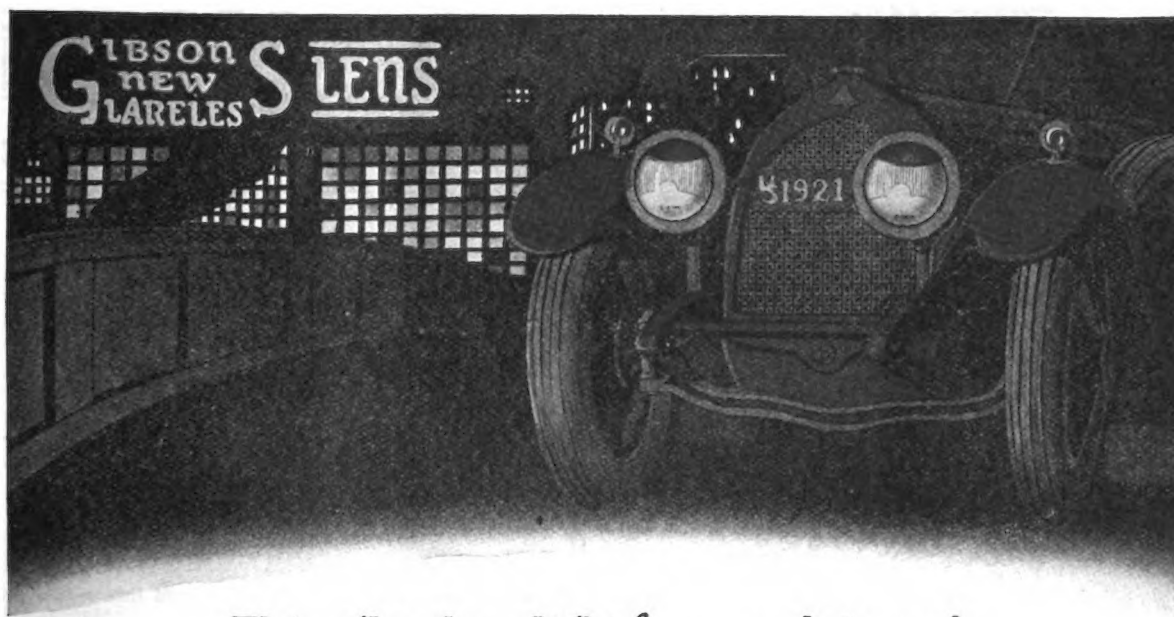
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Rutherford, N. J.

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Sterling Tires





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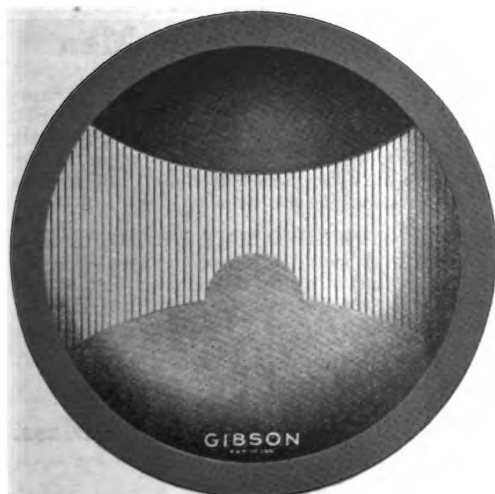
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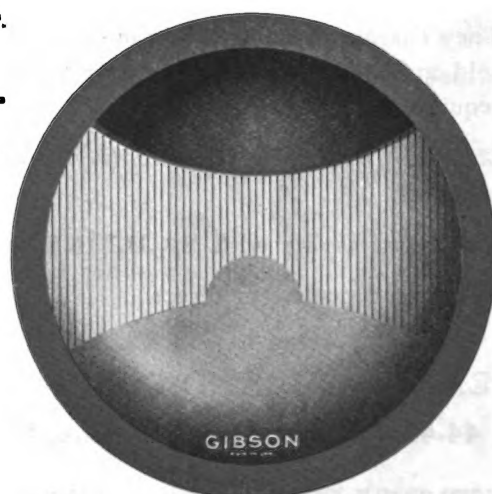
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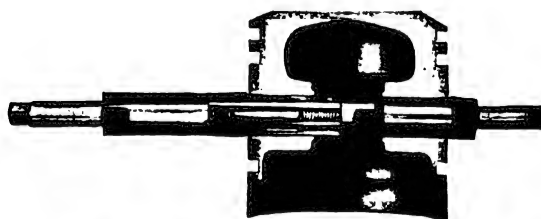
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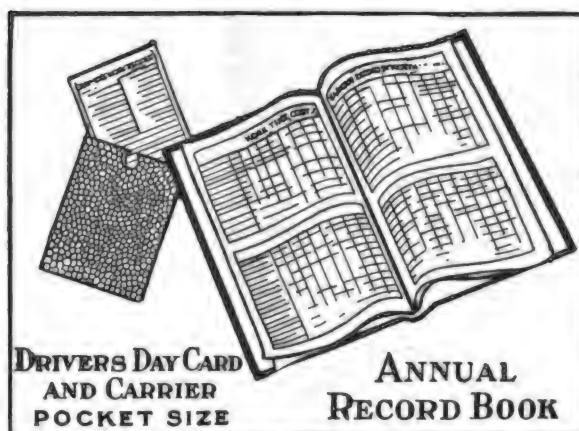
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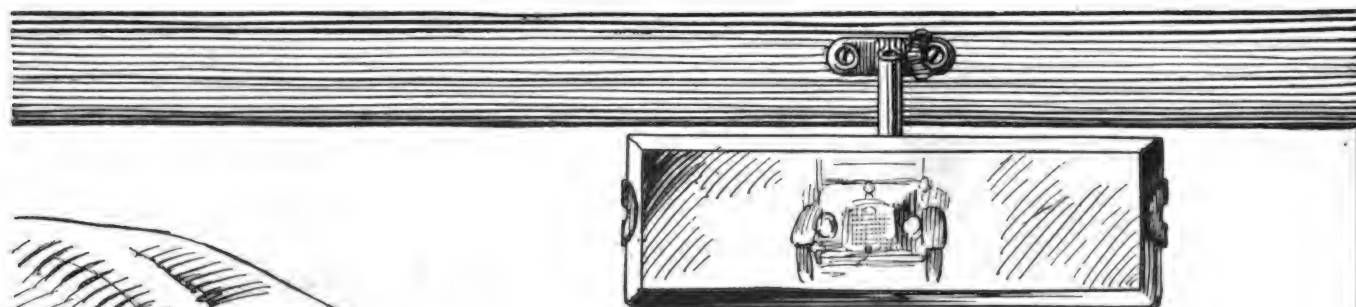
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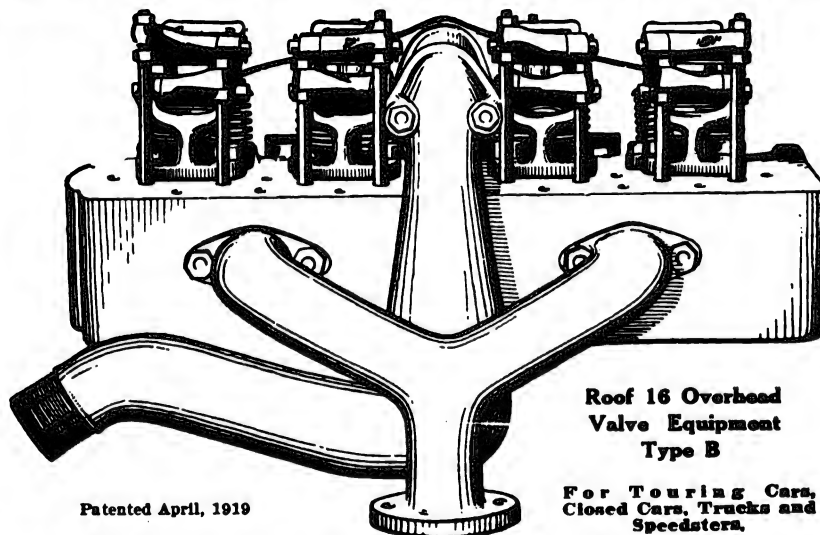
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POWER and SPEED ROOF 16 OVERHEAD VALVE EQUIPMENT for FORD and DODGE MOTORS



Patented April, 1919

Roof 16 Overhead Valve Equipment Type B

For Touring Cars, Closed Cars, Trucks and Speedsters.

Comparison Brake Horse Power Tests at the United States Bureau of Standards gave Standard Ford motor with regulation carburetor 18.7 Horse Power. The same motor with 16 Valve Head and regulation carburetor 22.4 Horse Power. The same motor with 16 Valve Head and Special carburetor 29.7 Horse Power. Recent tests at Bureau of Standards with Type B valve 32 Horse Power. We are Manufacturers and Distributors of speed and other specialties for Ford cars; 3 to 1 gears, high speed camshafts, aluminate, light grey iron, and magnesium pistons, alum-

inite connecting rods, racing spark plugs, racing carburetors, roller bearings, counterbalances, wire wheels, multiple speed transmission, high tension magnetos, special oiling systems, special worm and gear steering gear, racing tires, racing bodies, hood and radiator, parts for underselling chassis. Tell us what you want. We can supply it. Racing quality. Lowest prices. Send for our Complete Literature on how to build fast cars and double the value of your Ford Truck and descriptive circular on Speed and other Specialties for Fords and Dodges.

The Most Remarkable Power Device, Even in This Inventive Age

Hill climbing for touring cars—pulling power through sand and mud—doubles the hauling capacity of truck-speed for mile and half-mile tracks to rival the fastest cars built. Ford racing cars with our Cylinder Head Equipment and special racing parts have attained speeds from 80 to 100 miles per hour. Hill climbing and pulling power for touring cars, closed cars and trucks. Cylinder head equipment all ready for installation. It takes the place of the regular Ford or Dodge Cylinder Head. Any mechanic can easily and quickly install it.



Frank G. Carpenter

Tampa, Fla.

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Comparison Brake Horse Power Tests by U. S. Motor Transport Corps at Camp Holabird, Md., gave standard Dodge motor 37.7 horse power. The Same Motor carrying our Sixteen Valve Cylinder Head Equipment showed 60 HORSE POWER.

Ford Racing Car Speed Kings

From the hundreds of fast Ford car drivers we mention the names of a few of those who have won laurels through the use of our equipment and some with speed records approaching that of the highest priced racing cars in the world, ranging from 70 to 97 miles per hour, and who on mile and half mile tracks have closely approached the world's record with their speed cars:

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“Territory” should be big enough to insure a really profitable business for the dealer if he *works* it. Otherwise the United States is too small for the dealer who thinks a big piece of the *map* means a big piece of *money*.

So you see in almost every case the interests of the factory and the dealer are the same—if they look at it the *right* way.

Clarence A. Carl
President

BRISCOE MOTOR CORPORATION

Jackson, Mich.

The Canadian Briscoe Motor Company, Ltd., Brockville, Ont.

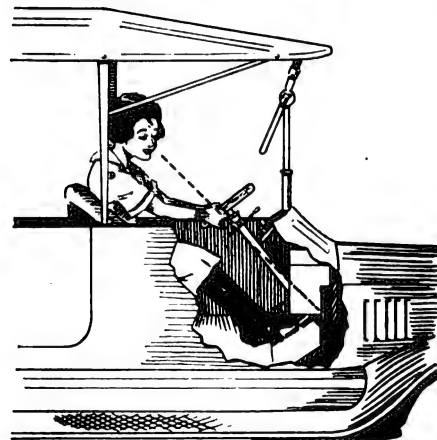
The Most Completely Equipped Car in America in Its Price Class

For Fords "Buffalo" Oil and Gasoline Gauges



Why get out and get under like this?

THE "Buffalo" Oil Gauge prevents burned-out bearings due to lack of oil; prevents carbon in cylinders and oily spark plugs due to too much oil. It saves the trouble of crawling under the car and becoming be-spattered with oil and grease. The "Buffalo" Oil Gauge saves big repair bills; stops the dirty work.



Keep in your seat and know the exact quantity of oil in your car.

Every Ford owner hates to crawl half way under the car to open the pet cock. It is a dirty job. You know it!

The "Buffalo" Oil Gauge is a vital necessity to overcome the troubles caused by faulty lubrication. It is made of the best materials; correctly designed; will outlast the life of the car; cannot clog or go wrong. The drain plug in the Gauge itself permits the drainage of oil from the car without removing the Gauge.

DEALERS: Here are two Ford accessories that will be great business getters for you. They sell on sight.

Every Ford owner needs these gauges on his car. They will save time and money.

The "Buffalo" Oil and Gasoline Gauges are simple in construction and can be easily installed by anyone with ordinary tools in a few minutes. Complete instructions with every gauge.

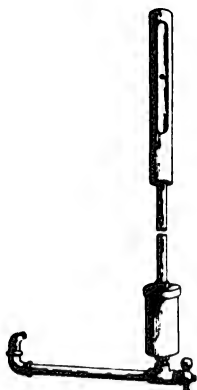
Price \$3.00 each. Send for samples and discounts to dealers.

The "Buffalo" Gasoline Gauge

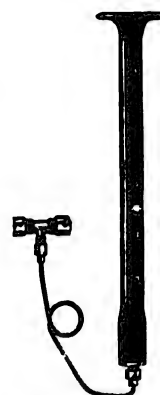
THIS thoroughly practical, inexpensive Gasoline Gauge does away with the necessity of raising the seat cushion, removing the filler cap and using a measuring stick.

The "Buffalo" Gasoline Gauge shows at all times the exact quantity of gasoline in the tank. A glance tells. The driver knows when he is getting full measure and proper mileage.

This Gauge is absolutely reliable: has no working parts to get out of order, no soldered joints that can leak.



Buffalo Oil Gauge Complete.



Buffalo Gasoline Gauge Complete.

O. K. LOCK COMPANY, Inc.

264 Broadway,

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AUTOMOBILE JOURNAL



Big Plants Build Lexington

DEVELOPMENT OF THIS VERSATILE CAR ONE OF STEADY ADVANCEMENT—FUTURE EXPANSION ENHANCED BY INCREASED MANUFACTURING FACILITIES—ALLIANCE OF PROMINENT PARTS MANUFACTURERS HEADED BY FRANK B. ANSTED.

(By S. G. SWIFT.)

THAT a record of splendid achievement will earn well-deserved recognition for automobile manufacturers wherever located is strikingly exemplified by the Lexington Motor Co. of Connersville, Ind.

The thousands of owners of this make of car, as well as the legion of dealers selling it, are but little acquainted with the history of the organization back of its success, and this story has been written with an idea of giving them a more specific and detailed resume of the concern from its inception up to the present time—proof that the Lexington car and the able executives responsible for its production are material factors in the automobile industry from all viewpoints.

Most owners know the merits and service-giving qualities of the car, and the following will give them an insight into the workings of the organization that, through experience and manufacturing facilities, has made it what it is.

There were approximately 2,000,000 passenger cars produced in the United States last year, the selling value of which was close to \$2,000,000,000. These machines were built in 129 factories, having a total plant and equipment investment of about \$800,000,000.

Figures may not be interesting, as a rule, but in this case they certainly are, as they show that the automobile indus-

try represents one of the three largest branches of activity in this country. While figures are not available in such form as to allow one to properly deter-

mine whether it ranks second or third in size, we know that it has passed through the experimental stage and is now firmly established as one of the world's greatest industries.

The present day successful builder of automobiles must be something more than a factory producer. The combination must be that of the highest developed engineering and merchandising methods, as the proportionate number of those who have been successful in this field is perhaps smaller than the average person realizes. Moody's Manual, a government compiled list of statistics, makes clear that on an average only about eight out of every 100 concerns return a fair profit to investors.

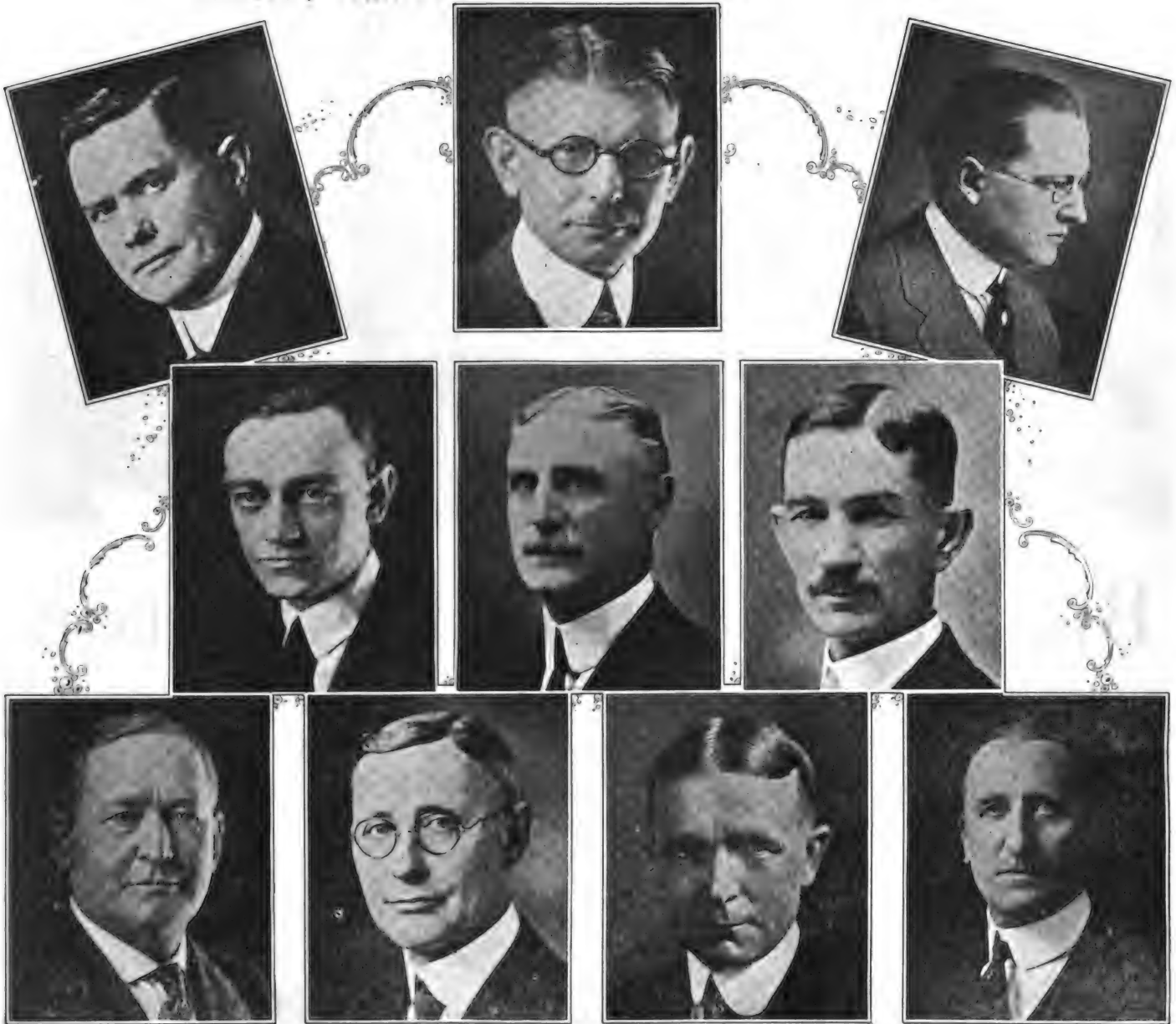
Management then must be the all-important item in the general industrial field. It is well-nigh everything in the business of building automobiles, and the great proportion of failures in this field has been caused by the lack of able executives, and the consequent unwise operation of the business.

It is not the purpose of the writer to go into detail regarding the different automobile manufacturers and their varying degrees of success. There are many of them known to the readers of this magazine, and the result of their good judgment is



Frank B. Ansted, President of the United States Automotive Corp.

Other Officers and Directors of the United States Automotive Corporation



Top Row, Left to Right—George W. Ansted, Vice President; Frederic I. Barrows, Vice President; Emery Huston, Vice President.
 Middle Row, Left to Right—LeRoy A. Hanson, Secretary; James M. Heron, Treasurer; John C. Moore, Chief Engineer and Director.
 Bottom Row, Left to Right—William B. Ansted, Director; Charles C. Hull, Director; A. O. Eberhart, Director; Elmer J. Hess, Director.

seen every day. They deserve their present position in the industrial world. It is a fitting tribute to their good management and, in this respect, the Lexington Motor Co. is a striking example of what ability and efficiency can accomplish.

The development of the Lexington Motor Co. has been one of steady advancement. Its great business, which dominates the life of a middle western city, is under the direction of a man who brought it from comparative obscurity in nine years to a place where its product enjoys full recognition as to quality, performance and service, and a world-wide market that keeps the present plant facilities working to capacity.

The growth of the company was so rapid the first several years that at times it appeared to be hard to secure the necessary cooperation between the different parts manufacturers, and during

the last few years this became so pronounced that there were times when it was actually difficult to secure volume



Elaborately Equipped Laboratory Is Maintained to Test Material.

and quality of units necessary to keep the plant running to full production schedule. It was to offset and eliminate this condition that the United States Automotive Corporation was formed as a holding company to take over the management of the several companies manufacturing the parts for the machine, and the advantages of such an alliance are already seen in production and profits.

Present Prosperity of Organization Due to Work of Frank B. Ansted.

"I don't know whether to tell you that the United States Automotive Corporation is the Lexington car, or the Lexington car is the United States Automotive Corporation," said a prominent citizen of Connersville. "I might say that the car made the corporation and the corporation made the car," he continued, "but the real dynamo behind it all is Frank B. Ansted, president of the corporation."

Subsequent investigation proved this to be true, although the actual sequence of events is that Frank B. Ansted first made the Lexington and then made the United States Automotive Corporation. More than any one man he is responsible for the success which has attended every achievement of these enterprises. Although still a comparatively young man, Mr. Ansted has had an unusually prosperous business career, and one that has ever been dominated by broad vision and the ambition to bring about that which he has visioned, all of which is emphatically vouched for by the present condition of his great organization.

He was graduated as a lawyer from the University of Michigan, had several years of banking experience, and was eventually made general manager of the Indiana Lamp Co., successfully bringing this business from a very small one to a place where its annual turn-over is in the hundreds of thousands of dollars.

It was at about this time that he began to get interested in the future possibilities of the automobile, with the result that in 1909 he went to Lexington, Ky., and signed a distributor's contract for the sale of Lexington cars in the Connersville territory. Again he demonstrated his ability and was successful. The officials of the factory were surprised to find that through his efforts they were selling more machines in Connersville than in many of the large cities.

For the best of reasons the entire factory was moved to Connersville and late in 1912, two years after he had become identified with the company, Mr. Ansted was given the reins of management. The business grew rapidly during the next three years, but he was not even then satisfied with the progress made and the outcome was the Minute Man Six. Production on this model started late in 1915.

The reception accorded to the new offering by the public needs no further telling, and bears ample testimony to the foresight and enthusiastic energy of a



Castings for the Ansted Engine Are Made in the Big Plant of the Connersville Foundry Corp. It Is Well Manned and Equipped.

young man who had the determination to make his dreams come true.

Sales figures immediately doubled and the company was soon in a position that



All Motors for Lexington Cars Are Scientifically Dynamometer-Tested.

guaranteed it a place in the front ranks of producers of high-grade cars, as is shown by the accompanying table of figures:

| Year Ending | No. of Cars | Car Sales |
|---------------------|-------------|--------------|
| July 1st, 1916..... | 743 | \$741,405.37 |
| July 1st, 1917..... | 2,942 | 2,736,381.74 |
| July 1st, 1918..... | 2,925 | 3,379,168.05 |
| July 1st, 1919..... | 3,487 | 5,236,542.40 |
| July 1st, 1920..... | 6,420 | 9,969,108.29 |

These figures were taken from certified statements of the company.

To the layman it now looked as though the future were easy sailing for the Lexington Motor Co. and as far as orders were concerned that was true. But there was something more than selling to be considered in the manufacture and distribution of the Lexington and the officials of this company soon found that production must be increased to lower production costs, the bug-a-boo of so many automobile builders. The organization was good and the product was right, but they felt that they were unable to secure the proper cooperation from parts manufacturers.

United States Automotive Corporation
Founded to Facilitate Manufacture.

Mr. Ansted, like so many ambitious men who have surmounted great obstacles, would be satisfied with nothing short of perfection. Motors were his hobby and he decided that he would build his own, and other parts as well.

As he could not handle such work in his factory he decided that the time was opportune for founding the United States Automotive Corporation. His first concern was to find the right men to fill the executive positions. In this, as in other things, he was successful, as the following list of names will make clear to those who are acquainted with the doings of the automotive industry:

George W. Ansted, vice president; for years an executive officer of the Western Spring & Axle Co., director of large enterprises centered around Connersville.

Frederic I. Barrows, vice president; legal, banking and manufacturing experience, associated with Frank B. Ansted in the Lexington since 1912.

Emery Huston, vice president; managing director of the Express Printing Co. For seven years has



The Tector-Hartley Motor Corp., Hagerstown, Ind., Is the Only Subsidiary of the U. S. A. C. Located Outside of Connersville, Ind.



Another View of the Several Buildings Engaged in the Production of Lexington Cars. Main Plant of Lexington Motor Co. in Foreground.

handled the successive Lexington publicity campaigns.

LeRoy A. Hanson, secretary; secretary and treasurer of Lexington Motor Co., formerly prominent in accessory business.

James M. Heron, treasurer; secretary and treasurer of Rex Manufacturing Co. for more than 20 years, a director in largest local bank, largely interested otherwise in community.

John C. Moore, chief engineer, Lexington Motor Co. His engineering achievements speak for him.

The remaining members of the board of directors are quite as fully identified with enterprises nationally known:

William B. Ansted, president of Central Manufacturing Co., for years builder of bodies for high-grade automobiles.

Charles C. Hull, president of the Rex Manufacturing Co., known throughout the world as builders of Rex All-Seasons tops.

A. O. Eberhart, Chicago; twice governor of the State of Minnesota, now general counsel of H. W. Dubiske & Co., and also a director of large industrial and mercantile enterprises of national fame.

Elmer J. Hess, for two decades one of the foremost spring and axle manufacturers of the country; prominently identified with manufacturing and banking interests in Cincinnati and Cleveland.

Realizing the truth of the oft-repeated maxim that "a company can only be as good as its management," even the most confirmed sceptic is bound to admit that the United States Automotive Corporation will be well manned by real business men, all of whom have won their places in the industrial life of this country.

The new corporation has an authorized capital of \$10,000,000 of preferred stock and 300,000 shares of "no-par-value" common stock, which will place under a single head the control and management of the several parts making plants whose production will enter into the finished

car. One with any business experience must realize the great asset that this alliance will be to the business.

Economies of manufacture and control



One Wing of the Ansted Engine Factory. All Plants Are Equally Modern.

of the source of units are assured in the manufacture of the Lexington, and the last obstacle removed from the pathway of progress. The new alliance makes the



Brick, Steel and Tile Were Used to Make the Ansted Spring & Axle Co. Absolutely Fireproof. This Is Where Lexington Springs Are Made.

Lexington Motor Co. a potent factor in the automotive world.

Many Well-Known Manufacturers Allied By New Business Move.

A brief review of those industries taken over by the corporation must be of concern to the reader who is interested in the development of passenger car enterprises. The corporation has options on several properties which have not yet been taken over, but those which have already been allied are: the Ansted Engineering Co., the Fayette Painting & Trimming Co., the Connersville Foundry Corporation, the Ansted Spring & Axle Co., all of Connersville, and the Teetor-Hartley Motor Corporation of Hagerstown, Ind.

The Ansted Engineering Co. was the logical plant to be selected for the very important work of building the motor. This company, founded by the late E. W. Ansted as a general engineering plant, for many years was successfully operated. The high type of mechanics employed by this organization and the general class of work turned out made it ideal for the production of the Ansted Engine. The management of the corporation felt that it had gone far when production was started on the new motor which has done so much to place the Lexington automobile in the high position it now occupies in the motor world.

The Connersville Foundry Corporation represents another important acquisition of the parent corporation. A perfect cylinder block casting is an absolute necessity in the making of a high-grade automobile motor and calls for the utmost skill and fine equipment. In work of this sort the Connersville Foundry Corporation excelled and its castings are used in some of America's finest cars besides the Lexington.

The Ansted Spring & Axle Co. was founded originally by the late Edward W. Ansted who, with his three sons, Frank B., George W. and the late Arthur A., were engaged in this and other large enterprises.

The buildings of this company are among the finest in a center that is distinctly a manufacturing community and are equipped with machinery and appliances necessary for economical production on a large scale.

This plant, one of the largest of its kind in the country, has an annual capacity of 4000 tons of springs. There are five principal buildings with an aggregate floor space of 115,000 square feet, which occupy about four acres of land with excellent railroad facilities.

It is natural to assume that this plant under its present management with an established market for its product should do more business than it has ever done in the past. The active management of the spring business is in the hands of E. M. Hunker, who has had more than 15 years of active experience.

The system by which practically all of the corporation's buildings are laid out is commendable and spells efficiency. There are more than half a million feet of floor space in the several plants and without exception these buildings have been fitted with automatic sprinklers, thus effectively doing away with the possibility of loss of production through fire.

Each plant works on the progressive system of manufacture. In effect this method means that the layout is such that raw materials enter the building at one end and come out as finished goods at the other. No one piece of material is allowed to pass the same point more than once.

Telephones reach every nook and corner of each department and electric call bells summon supervisors, superintendents and executives.

Coal is handled by machinery and transportation through the buildings is by overhead trolleys and miniature motor trucks or "shop mules," the latter frequently being operated with long trains of trailers. This corporation long ago proved the efficiency of the commercial hauler and has a large fleet of them in the factory yards and on the roads.



Without Doubt the Ansted Engine Is One of the Best Known Motors on the Market Today. It Is Built "Next-Door" to Lexington.

Lexington Believes Contented Employees Are a Decided Asset.

Everything possible has been done to make the employees contented with their



Twin Final Assembly Lines Are Necessary to Meet Demand for Lexingtons.

work. Equipment and lighting facilities are the best that can be had and each plant is provided with large wash rooms

and ample steel lockers for clothing.

There is no such thing as dirt in these great plants, this being done away with by means of the blower system, which works somewhat on the principle of the vacuum cleaner. Even the finest dust from the speeding emery wheels is automatically sucked up by means of this system and the whole atmosphere of the factories is as clean and wholesome as one could wish.

This great corporation is especially concerned with the housing of its workers and, without going into details, has done a vast amount of work along this line, as its employees will testify. All of this cannot but result in attracting high-grade help and the visitor is struck with the very intelligent class of workmen seen throughout the whole organization.

The executive officers of the Lexington Motor Co. and the United States Automotive Corporation, the former, of course, being the main subsidiary of the latter, are all housed in the building that was the original Lexington factory. This building, which has been completely remodelled, is barely large enough for the use to which it is now put, which gives one an idea of the present scope of the organization as compared with its former size.

John C. Moore Responsible for Notable Features of the Lexington.

There is one person in the Lexington organization whose efforts along mechanical lines have had no small part in the establishing of the present mammoth business. That man is John C. Moore, who designed his first car in 1899, as well as the latest model, the Minute Man Six. The first automobile produced was far from the actual ideal that he had in mind and, in 1901, he again designed a machine which was a decided improvement over his first. He was still far from satisfied, however, and continued in his development work until, in 1907, when he felt that he had a satisfactory machine, he, with a group of friends, started to produce the Lexington for the public.

Several of these old machines are still



"Service" Is a Thread-Bare Word, but It Receives Its True Definition in the Subsidiary of the Lexington Motor Co. Shown Above.



One of the Newest Subsidiaries of the U. S. A. C. Is the Fayette Painting & Trimming Co., Where Lexington Open Bodies Are Finished.

giving good service and are frequently seen on the streets.

Engineering practise has always believed that the natural balance in a gasoline engine is best obtained by the six-cylinder design because of the effect of the overlapping power stroke, but it remained for Mr. Moore to prove that the overlapping exhaust stroke did much to mitigate the advantage of the overlapping power stroke. This led to his invention of the Moore Multiple Exhaust System in 1911, which is used exclusively by the Lexington Motor Co. Another of Mr. Moore's important recent develop-

ments striking testimony to show that he has improved each successive model and kept well ahead of the times. The Lexington affords a combination which includes simplified design, lasting stability and perfectly coordinating mechanism. These are the result of painstaking work on the part of its designer, a tribute to the mechanical genius of Mr. Moore.

Ansted Engine Develops Remarkable Power Considering Bore and Stroke.

The Ansted Engine embodies many new and novel features which were adopted only after exhaustive tests.

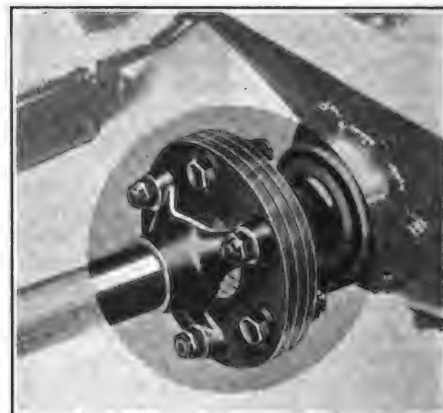
The Ansted Engine is a six-cylinder, vertical, four-cycle type, having overhead valves of unusually large size. The bore

Ansted Engine is said to develop 50 per cent. more horsepower than the conventional engine of the same size.

The pounds of car weight per horsepower is unusually low, 44 pounds per horsepower, which accounts for the excellent road performance of the car. It climbs a 10 per cent. grade on "high" with five passengers without effort and does better than 60 miles an hour on the straightaway.

The cylinders of the Ansted Engine are cast en bloc with the upper half of the crank case integral. Water jackets extend the entire length of the cylinder barrels and completely surround the cylinders, thus assuring perfect cooling of the motor.

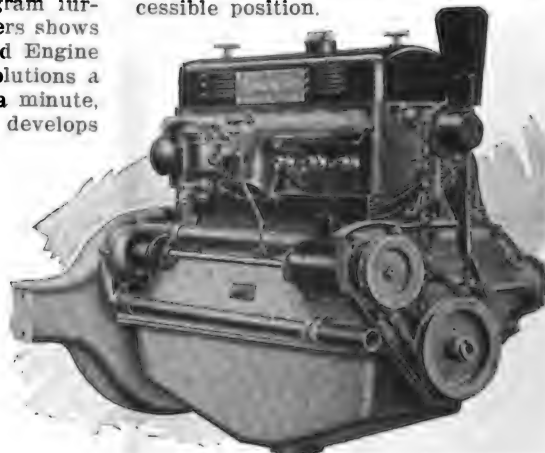
The cylinder head is made detachable and carries the valve and rocker arm assembly. A copper asbestos gasket packs the joint between the cylinder head and the cylinders and, when the head and gasket are tightened securely by long steel alloy bolts, the joint is sealed com-



Three Fabric Discs Bolted Together Form Strong, Flexible Universal Joint.

pression tight. The intake manifold is cast in the cylinder head, and is so designed that it can be ground out smooth before assembly, thereby removing any tendency for unvaporized gasoline to cling to the walls and cause the engine to "load up." In grinding valves the cylinder head is carried to a bench, where it can be handled more easily and without liability of marring the finish on the body and fenders.

A cylinder head cover fits over the overhead valve mechanism and rocker arms. The oil filler opening is located in the top of the cover in an easily accessible position.



Right Side of the Ansted Engine.



Series "T"
Seven-Passenger
Touring
Car.

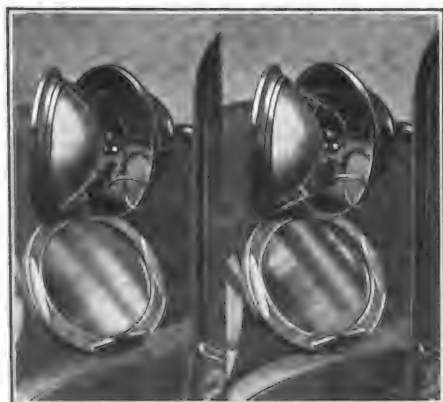
ments is seen in the Lexi-Gasifier whereby the motor fuel is rendered perfectly gaseous by means of a heated grid in the intake manifold.

He has done much in automotive development, and the present Lexington of-

is $3\frac{1}{4}$ inches, with a stroke of $4\frac{1}{2}$ inches. The power actually developed on block test shows 65 horsepower at 3000 revolutions a minute, with a piston displacement of only 224 cubic inches.

A study of the engine diagram furnished by the Lexington engineers shows that the horsepower of the Ansted Engine increases rapidly from 200 revolutions a minute up to 3200 revolutions a minute, and at this point the engine develops 73.5 horsepower.

Engineering tests determined that the horsepower maximum per cubic inch of piston displacement was 0.325, or almost one-third of a horsepower per cubic inch. Racing cars at the last 500-mile-race had about 0.5 horsepower per cubic inch. The average L-head engine has about 0.20, or one-fifth of a horsepower per cubic inch of piston displacement. The

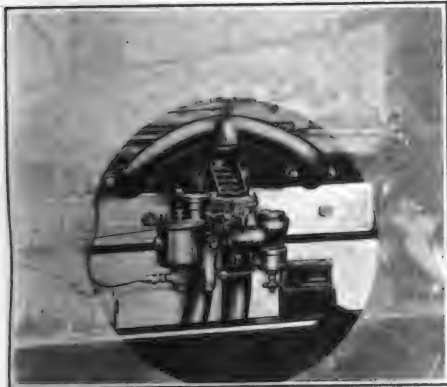


In Its Exclusive 2-Way Head Lamps Lexington Has Scientific Lights.

Intake and Exhaust Manifolds Combined Into Lexi-gasifier.

The intake and exhaust manifolds are combined in the Ansted Engine, and are located on the right hand side of the engine. The two separate exhaust lines of the Moore Multiple Exhaust System pass along each side of the Lexi-gasifier, both being Lexington features. The combination of the two units assures a uniformly dry fuel mixture reaching the combustion chambers either in summer or winter. The dry mixture prevents excessive oil pollution due to unburned fuel getting past the pistons and into the crank case oil, reducing the lubricating value of the oil and perhaps causing burnt out bearings.

The crank shaft is a three-journal type, of special massive design, having the front bearing $1\frac{1}{4}$ inches in diameter by $2\frac{31}{64}$ inches long, second bearing $2\frac{1}{4}$ inches in diameter by $2\frac{3}{4}$ inches long, and the third bearing $2\frac{3}{8}$ inches in diameter by $3\frac{1}{8}$ inches long. The crank pin



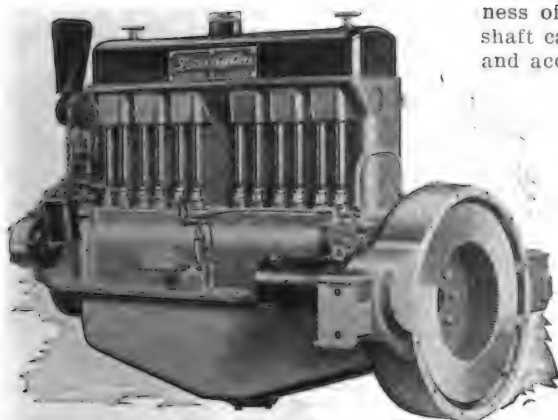
This Cut-Away View of the Lexi-Gasifier Shows Its Strategic Location.

is $2\frac{1}{4}$ inches in diameter by $1\frac{1}{2}$ inches long.

The crank shaft is made of drop-forged steel, hardened and ground, and is fitted with flywheel flange cast integral at the rear end, and having oil ways drilled the full length of the shaft.

The bearings of the crank shaft journals are composed of babbitt backed with bronze, the thickness of the shell being $\frac{3}{32}$ of an inch.

The main and connecting rod bearings are grooveless. This is only possible with a positive pressure lubricating system such as is used on the Ansted Engine. The bearings are reamed to exact size when made and do not have to be



Left Side of the Ansted Engine.



Several Tons of Lexington Springs Ready for Delivery from the Ansted Spring & Axle Co. to Lexington's Inspection Department.

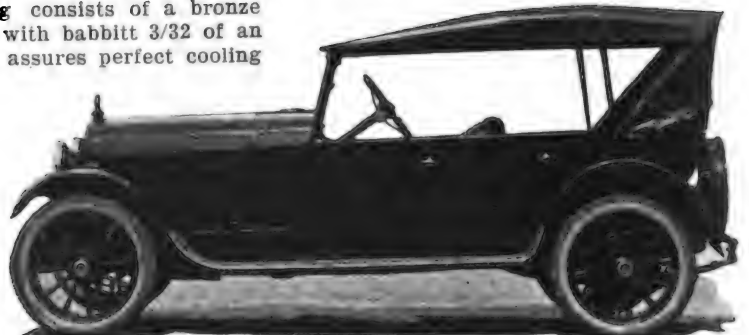
fitted to the crank shaft. They are assembled with 0.0015-inch to .003-inch ($\frac{1}{4}$ thousandths to three thousandths of an inch) clearance. There are no shims to break the oil film on the bearings, the principle of the bearing being to keep a film of oil constantly between the crank pin and bearing.

The connecting rods are of the spade type, which gives them great strength and assures a perfect bearing support. The end bearing consists of a bronze back shell lined with babbitt $\frac{3}{32}$ of an inch deep. This assures perfect cooling

ing gear in the timing gear set.

The pistons are of cast iron, perfectly balanced to prevent vibration, and are fitted with two rings each at the top, which prevent the leakage of compression, while holes drilled in the edge of the piston ring grooves conduct the excess oil back into the oil reservoir. The pistons are $3\frac{17}{32}$ inches long, $\frac{1}{8}$ inch thick at the top and $\frac{1}{16}$ inch thick in the walls of the piston. The piston pins

Series "S" Five-Passenger Touring Car.

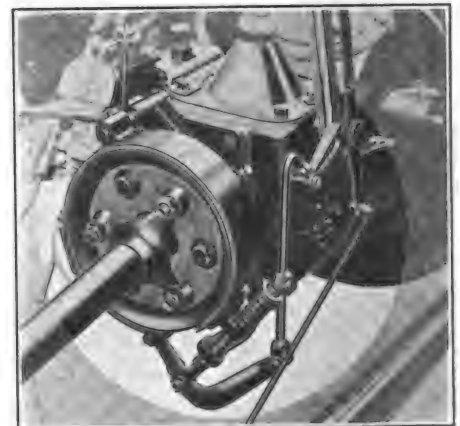


of the bearing, which is not possible where a removable bushing is used.

The cams and cam shaft are made integral, and are forged from 10 to 20 per cent. open-hearth carbon steel. The wearing surfaces of the cams and bearings are carbonized to $\frac{1}{16}$ of an inch in depth and hardened to scleroscope hardness of from 70 to 90 points. The cam shaft cams are ground to a smooth finish and accurate sizes on special cam grinding machines. The cams are wide faced and of large diameter, while roller push rods insure quietness of operation and accurate timing of valve opening and closing.

The cam shaft and cams are of a size which readily allow their removal with the bearings through the timing gear set after the cover of the gear set has been removed. A gear flange is cast integral with the cam shaft, to which is attached, with steel alloy bolts, the driv-

are .873 inch in diameter and from $\frac{9}{16}$ to $\frac{11}{32}$ inch inside diameter. The steel from which they are made is steel alloy No. 1020, recommended by the S. A. E. formula, annealed and case-hardened.



This Is Really a "One-Finger" Emergency Brake—Easy but Powerful.

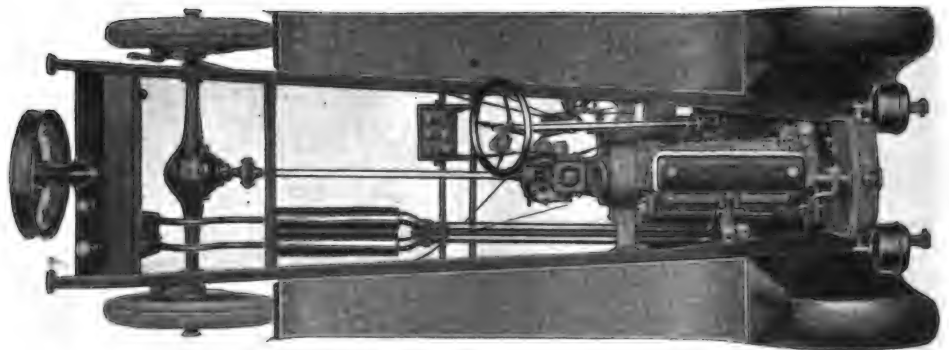


A View in One of the Finishing Rooms Where Lexington Cars Receive That Glossy Outer Coat That Makes Them Sparkle on Highway or Boulevard.

The valve mechanism, located overhead, is unique in many features, namely: the rocker arm action, the size of the valves for the size of the cylinders, the enclosure of the push rods, the accessibility of the parts, the use of but two timing gears, the design of the cams, and the ease with which the motor may be timed. The combination of a specially designed cam, the use of a $1\frac{1}{2}$ -inch roller follower, and the variable fulcrum, or ratio rocker arm, have made it possible to use nearly $7/16$ -inch valve lift (0.415-inch) and still keep the valve mechanism quiet enough for a passenger car. This is the lift used by most racing cars, but until now thought impossible in a passenger car because of the noisy operation. This lift accounts for the unusual power of the Lexington car equipped with the Ansted Engine. The rocker arms can also be adjusted while the engine is operating, making possible the finding of a point of noiseless operation by ear instead of by feel. The push rods are enclosed in tubes, which protect them and also serve to hold the valve tappet guides in place. Removing a tube permits the removal of the entire valve tappet, valve tappet guide, and roller. Using only two helical gears makes it a manufacturing possibility to get timing gears that will stay quiet. The valves are $1\frac{1}{4}$ inches in diameter and have a clear opening of $1\frac{1}{8}$ inches. They are tulip-shaped and held in place by dual springs, which is another factor contrib-

uting to the quiet operation of the Ansted Engine valve mechanism.

The ball thrust bearing, against which the clutch pedal releasing fork bears, is larger than customary to insure long life. It is also provided with an oil feed from the front end of the



Plan View of the Series "T" Lexington Chassis. Note the Clean-Cut but Sturdy Appearance of the Entire Lay-Out, Especially the Frame.

transmission so that it will not need attention from the driver.

By using the large double-row ball bearing at the rear end of the gear set, designed especially for this purpose, all end thrust due to the movement of the propeller shaft is taken by the bearing, instead of being transmitted to the spigot and front bearings of the transmission unit as heretofore.

The rear system of the car, comprising the propeller shaft, universal joints and axles, together with the units of each, are the same in both series, no special change being made.

Brake Operation Unique on All Current Lexington Models.

There are two independent brake systems in use on the current Lexington models; one operating on the rear end of the transmission, which is actuated by a hand lever, and called the "one-finger" emergency brake, and the second, the service or foot brake, which operates on the drums attached to the rear wheels.

The emergency brake consists of a contracting band and is operated by special linkage in which there is a stiff brake applying spring. By the use of this spring, which is a Lexington feature, the brake is practical in use and can be applied by a pull of one finger.

The cable-operated service brake is another exclusive Lexington feature. The use of a single cable, working over an equalizing pulley on the foot pedal, assures perfectly even pressure on each brake drum and therefore uniform braking on each wheel. The use of the cable also eliminates all braking difficulties which occur when rods are used to operate the rear wheel brakes on a chassis having Hotchkiss drive. In this cable brake design the deceleration of the car is uniform from the time the brakes are applied until they are released. With linkage there is a tendency for the brakes to chatter, and the deceleration

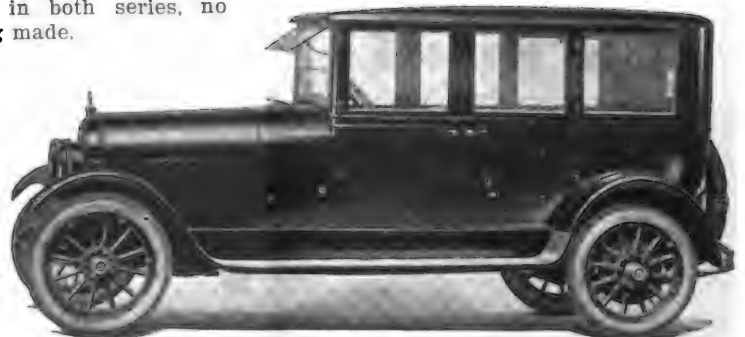
to be jerky, due to the alternate applying and releasing of the brakes caused by the spring action with a Hotchkiss drive. The use of the cable also eliminates brake-rod rattle. The rear brakes are external contracting, fitting the outside of the brake drums.

Frame Design Is Unique in That It Is Lighter but Stronger.

An extra-deep Z-section-type frame is used, having a channel depth of $7\frac{3}{4}$ inches, amply reinforced with angles on



Series "T" Four-Passenger Sedanette.



Series "T" Seven-Passenger Salon Sedan.

the bottom which gives a depth equivalent to a nine-inch frame. At the rear end the frame has a considerable kick-up to allow for the use of easy riding springs.

The running boards are bolted to the angle plate along the bottom of the frame side members. This differs from the rivetted type, as it allows the boards to be easily replaced in case of accident. This form of running board support adds strength to the frame members and supports the bottom edge of the fenders.

The frame cross members serve double functions in most cases. The second cross member supports the motor at the front end, and the bell housing arms, when attached to the frame, act as a cross member as well as supporting the motor at the rear. The next two cross members serve as running board stiffeners and support the battery. The next cross member stiffens up the frame at the kick-up and forms the heel board for the rear seat. The last, or rear cross member, is reinforced by a plate 12 inches wide on top of the frame, which protects the gasoline tank, provides a support for the spare tire carrier and finishes off the rear end of the car.



Careful, Conscientious Craftsmen, Factory-Trained, Are Employed in the Servicing of Lexington Cars That Suffer Through Age or Accident.

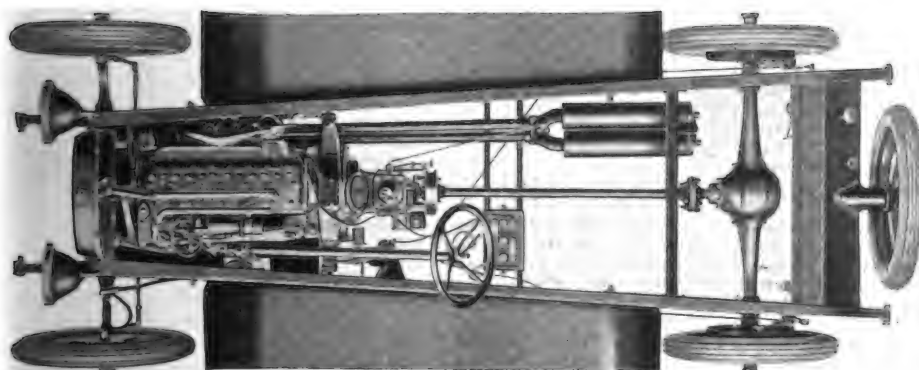
the front end against road shocks, which serves the purpose of holding the front end steady even at high speed, and allows the rear end of the car to ride level, the wheels in effect rising and falling to

through the admittedly slack period in other lines of industry.

The sales policy of the company has been far-reaching and all comprehensive with the result that today there are Lexington dealers in every city of prominence in the United States, and it is represented in practically all foreign countries. The recent victories of the cars in economy competitions as well as road races has resulted in a marked stimulation of an already satisfactory market, with the result that the facilities of the big organization are taxed to the utmost to keep pace with distribution, especially since newer models were announced.

The Lexington automobile is one of the few cars that is "advertised by its owners." The choosing of the name, "Minute Man Six," has proven to be a good selection and everyone knows of the car and its sterling performance.

The future prosperity of the United States Automotive Corporation is backed by two essential factors—its able management and the high quality of its product. The policy of the company has been distinctive and the interests of dealer and consumer have at all times been paramount, which, as much as the high quality of the car, accounts for the substantial world-wide demand that has been created. It has bullded permanently, by manufacturing to an established, time-tried principle and constantly striving to better the standard set, all of which has made it one of the leaders in its field.



Plan View of the Series "S" Lexington Chassis. Note the Double Exhaust Lines and Twin Mufflers of the Moore Multiple Exhaust System.

The spring lengths have been carefully worked out from actual road practise and the engineers have found that the proper proportion for the weight of the car demands that the front springs be made only 32-inches long, while the rear springs have the unusual length of 52 inches.

This combination in effect hinges the weight of the car around the front axle with just enough resilience to cushion

the contour of the road, while the body follows a straight line.

The series "T" line comprises a seven-passenger touring car, a four-passenger sedanette, and a seven-passenger salon sedan. The series "S" line includes the four-passenger Thorobred sport, the five-passenger touring car, the five-passenger Lex-Sedan, the four-passenger coupe, and the five-passenger sedan.

For more than five years the demand for Lexington cars has exceeded the production. The recent period of readjustment found the factory still behind with orders and the rush continued even



Series "S" Four-Passenger Coupe.



Series "S" Five-Passenger Sedan.

Specifications of Series "S" and Series "T" Lexington Models

ENGINE: SERIES "S"—Cylinders cast en bloc with removable head. Bore, 3 1/4 inches; stroke, 4 1/4 inches. Upper half of crank case aluminum, lower half pressed steel. Total piston displacement, 224 cubic inches. S. A. E. rating, 25.4 horsepower. Engine actually develops 46.3 horsepower at 2400 revolutions per minute, because of Lexi-Gasifier and Moore multiple exhaust system, exclusive Lexington features. Crank shaft supported on three large journals lined with Phoenix babbitt backed with bronze. Valve mechanism entirely enclosed, operated by cam shaft having cams integral. Lubrication, force feed to all bearings by pressure pump.

ENGINE: SERIES "T"—Cylinders cast en bloc with overhead valves. Bore, 3 1/4 inches; stroke, 4 1/4 inches. Upper half of crank case cast integral with cylinders, lower half pressed steel. Total piston displacement, 224 cubic inches. S. A. E. rating, 25.4 horsepower. The Ansted Engine actually develops more than 70 horsepower at 3000 revolutions per minute, because of the Lexi-Gasifier and Moore multiple exhaust system, exclusive Lexington features. Crank shaft supported on three large journals, babbitt lined and backed with bronze. Valve mechanism, entirely enclosed, operated by "rocking chair" rocker arms. Lubrication by force pump feed to all bearings through hollow crank shaft.

IGNITION—Vertical distributor integral with engine, with storage battery floating in line. Provided with automatic kick-off preventing battery discharging if switch is left on. Ignition circuit independent of lighting and starting circuits.

LIGHTING—Vacuum-controlled 2-way head lamps give full light at all times, but comply with all laws. Six-volt generator automatically regulates current. Battery located under driver's seat and easily accessible. Ammeter is plainly visible as part of neatly arranged cluster on instrument board. Lighting circuit independent of ignition and starting circuits.

STARTING—High-speed electric motor engages with fly wheel ring gear through Bendix drive and movable pinion, automatically disengaging after engine starts. Spins engine 140 revolutions per minute, insuring quick starting. Starter button on floor. Starting circuit independent of ignition and lighting circuits.

CARBURETOR—Intake and exhaust manifolds combined into Lexi-Gasifier, thoroughly vaporizing entering mixture. Vacuum feed from fuel tank at rear of car.

TRANSMISSION—Selective sliding type with shift lever at driver's right. Three speeds forward and reverse. Gears 3 1/2 per cent, nickel, 8-8 pitch, and 3/4-inch face, mounted on high-grade ball and roller bearings. Tire pump and speedometer driven by gears contained in same case.

COOLING—Cellular radiator in conjunction with centrifugal water pump and self-oiling fan.

CLUTCH: SERIES "S"—Dry disc type. Engages without grabbing. Operated by left foot pedal.

CLUTCH: SERIES "T"—Dry multiple disc type; Ansted-built. Engages without grabbing. Operated by left foot pedal.

PROPELLOR SHAFT—Seamless nickel steel tubing, 1 1/4 inches in diameter, with flanges electrically welded. Fitted with fabric discs to take universal action, eliminating noise and necessity of lubrication.

AXLES—Front: I-beam section drop forging. Rear: full-floating, with heavy pressed steel housing carrying all weight, leaving driving shafts free from strain. Final drive through spiral bevel gears.

BRAKES—Service brake: external contracting on 16-inch drums on rear wheels. Operated by right foot pedal through strong but flexible steel cables. Brake action equalized by passing over pulley behind brake pedal. Emergency brake: external contracting at rear of transmission gear set case. Acts on eight-inch drum mounted on propeller shaft. Operated by hand lever at driver's right. Known as the "one-finger" brake!

FRAME—Z-section, of 22-point carbon steel. Side rails are two inches wide on top with a depth of 7 1/2 inches. Wide running boards are bolted to side rails, making an integral unit of great strength. Ample reinforced with cross members, hot-riveted at joints.

SPRINGS: SERIES "S"—Front: Semi-elliptic, 32 by 2 inches. Rear: semi-elliptic, 56 by 2 inches. All spring eyes fitted with self-oiling bushings.

SPRINGS: SERIES "T"—Front: semi-elliptic, 34 by 2 inches. Rear: semi-elliptic, 56 by 2 inches. All spring eyes fitted with self-oiling bushings.

STEERING—Irreversible worm and gear. Eighteen-inch notched walnut wheel at left. Hand throttle and spark control on quadrant, with horn button in center.

TIRE RACK—Distinctive design, hot-riveted to rear of frame. Carries one or two spares.

TIRES—Four cord tires are regular equipment. Series "S," Front and rear, 32 by 4 inches. Series "T," Front and rear, 32 by 4 1/4 inches.

WHEELBASE—Series "S," 122 inches; Series "T," 128 inches.

WHEELS—Heavy artillery type with steel felloe bands. All spokes 1 1/4 inches. Wheels mounted on high-grade ball bearings.

WIRING—Single wire system with all circuits protected by fuses and conduit.

*Editor's Note—Specifications run separately where Series "S" and Series "T" Differ.



(By WILLIAM K. GIBBS.)

QUO VADIS—Which way? Are you asking yourself which way you shall go for the summer tour? Have you been wondering where you can find a worth-while place where nature is kind, where climate is right, where there is a diversity of scene—a vacation land where there are all the pleasures and none of the regrets?

Then let me tell you the place; let me settle this question that probably has been puzzling you all winter and that even now, with the warming days of Old Sol whispering to you with all the wiles of a siren that you should be up and away, is far from solution.

For those who think they know the middle west and base their judgment on their knowledge of Ohio, Indiana, Illinois, lower Michigan, Iowa, Minnesota or Wisconsin, there is a surprise in store in the upper peninsula of Michigan, which has been given the euphonious name of "Cloverland." Here the name means more than the mere word implies.

Something over 2000 miles of ideal roads link up practically every part of Cloverland. Until last year the building of roads had not progressed sufficiently to make the country especially inviting to the tourist, but last summer saw prac-

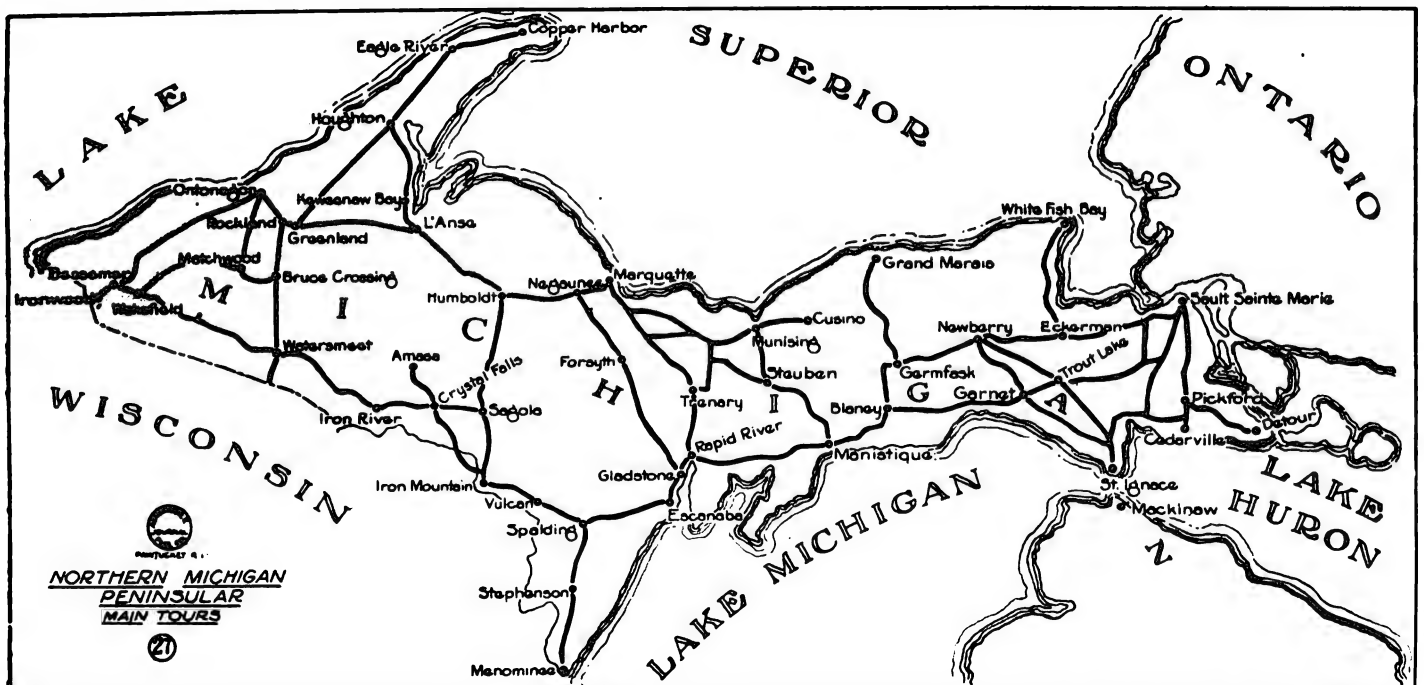
tically all of the connecting links completed so that one may tour in comfort. One hardly expects to find such continuously good roads through miles and miles of dense forest. There are stretches of 20 to 30 miles at times where one sees nothing but an occasional lumber camp, or a cluster of cottages around the shores of a lake, but the highways are as well kept as if the road run through the most prosperous and thickly populated area in the country. Moreover, there is the additional charm of driving through the cool woods where you may become intimate with nature at her best. Truly here is nature's rendezvous, for her handiwork is exemplified on every hand; the master painter here finds expression for her choicest talents.

There are so many places to go, so much to be seen, so much of legendary history and fact, such volume of historic interest, that to describe all in a few hundred words, or even a few hundred thousand, brings to the writer a feeling similar to that which you might have were you to be given carte blanche to go into the treasure room of an Indian prince and make a selection of such gems as you wished. In other words, you scarcely know where to draw the line of demarcation.

There are several ways of getting to this remarkable but little known land of good roads and scenic beauty. The three main gateways are: Menominee, which reaches the center of the peninsula from east to west; St. Ignace, the eastern gateway at the straits of Mackinac; and Hurley, Wis., the western gateway for those coming in from the Minneapolis district. From any of these points a circle tour, embracing practically all of the peninsula, or any part, can be made.

From the Menominee Gateway.

From the Menominee gateway one enters a very scenic district. Hundreds of years ago when the giant glaciers swept southward from the Arctic, chiseling the shore lines of the Great Lakes and dotting the central west with countless smaller lakes and otherwise fashioning the contour of the country in the upper Mississippi valley, this monster ice sheet very kindly deposited a part of its vast load in three distinct and separate sections of Cloverland. These three sections are the rugged iron ranges—the Menominee, Gogebic and Marquette, that, separately, or as a whole, remind one of a miniature Colorado. Here you will find the same enchantment, the same colorings, the same charm. True, you will not find the extreme heights, the yawn-



ing chasms and the bald peaks nude of verdure, but here you will find a combination of rugged country with all the kaleidoscopic mantle of nature such as she produces only in the lower altitudes, and you will appreciate it all the more because of its nearness. When you are in the majestic Rockies you feel like a pigmy; here you feel like a king: as if here nature had done her best work on a smaller scale, but bearing all the marks of finish and thought that marks the model as compared with the actual size production. These ranges were made for man; not giants.

Of the Menominee range, which is nearest the central gateway, Iron Mountain is the chief city, being about 30 miles west of Spalding and 70 miles from Menominee. Almost from the moment you leave Spalding you begin climbing through forests, which bring home to you what Longfellow meant when he penned the first line of "Acadia:" "This is the forest primeval."

Like all mountain roads which never seem in a hurry to get anywhere; that is, they wind about and seem uncertain where they will go next, the Cloverland

Cripple Creek and Salida, for example, although, of course, the altitude is low and the mantle of vegetation surrounding seems more colorful. The city has the distinction of having three good sized lakes within its corporate limits.

At Iron Mountain is what golf experts and champions term the "sportiest course in this country"—the Pine Grove Golf club's unique grounds, where the fairways have been veritably hewn from the pine forest and where the hazards are many and the term correctly applied. Devotees of "cow pasture pool" come here every year to test their prowess.

Continuing west from Iron Mountain, other mining towns of importance occasionally swing into view. Magnificent timber lines either side of the road, forming an archway of verdure through which the shafts of sunlight piercing the lofty canopy throw fantastic pictures and a network of shadows over the smooth, white surface of the trail. Splendid gravel, smooth and hard as the old pikes common to the East before the gasoline vehicle was in swaddling clothes, winds through this heritage of nature, first to the summit of a lofty hill, then dipping

that Ironwood is destined to become the largest city in Michigan north of the straits of Mackinac.

To the north of the Gogebic iron range is Ontonagon and the Porcupine mountains, reached by a branch of the Cloverland trail from Watersmeet. Ontonagon is famous for the first discovery of red metal, or copper, in this country. Even as far back as 1636, knowledge of rich copper deposits here was known in continental Europe, this fact being established by a book which was published in Paris that year. It was many years after, however, that the territory came into its own. Aside from the prominence gained through the discovery of copper here, Ontonagon can interest the tourist in other ways.

An excellent highway leads south along Superior's shore to the Porcupine mountains, about 18 miles away. At the base of the mountains, however, the motor car must give way to that original means of touring—shank's mare. The Porcupines are wild. Seeing them properly makes necessary hiking the paths that once knew the stealthy patter of moccasined feet. But the effort is well worth while. The delicious odor of pine and fir stimulates the real lover of nature. From the heights the views are superb—the broad expanse of Superior blends with the fertile farms stretching to the east from Ontonagon and the farms in turn blend with the very backbone of the Copper range. Up in the Porcupines are wonderful lakes, rushing streams teeming with trout, beautiful camping spots that are yours for one consideration—putting out your camp fire. Here is virgin forest—woods that never have echoed the song of the saw or the chop of an axe.

A Veritable Rendezvous of Nature.

This is a veritable rendezvous of nature, inspiring to the artist, the writer, the layman, or anyone who can thrill at the song of a bird in his habitat, at the fresh sweetness of the forest, at the shimmering lakes in the sunlight, or moonlight, at nature in her best dress. A week, or a month, no matter how long you stay, once in the Porcupines you are loathe to leave. The seasoned tourist who knows the Adirondacks, the woods of Maine, the towering Rockies or the Swiss Alps, agrees that the Porcupine mountains have a special charm that is second to none.

Experts in the organization of comfort for tourists and travelers have expended their best effort in devising ways in which the least time and trouble are expended in gaining access to the sights of greatest interest in the Ontonagon district. There was a day, not so long ago when a motor trip through Ontonagon county was the limit of possibility for the most skillful driver. It was then that the necessity for better highways was seen by the people and they set to work to bring about improvements; their efforts having borne fruit in the way of ideal roads practically throughout the county.

To the east there are three routes to Houghton, the capital of Copperdom. Although Houghton's sister city, Hancock, and Calumet, a few miles to the north,



In Center Is the Now Abandoned Fort Wilkins at the Northern End of Keweenaw Point. The Building at the Extreme Right Is Quarters of the Lighthouse Keeper.

trail winds its serpentine way westward. You rise some 1500 feet between Spalding and Iron Mountain.

If you have ever been in a position truthfully to repeat the famous Pershing phrase, "Lafayette, we are here," you very likely are familiar with the layout of streets in European villages. If you haven't been across, mayhap the movies have shown you. If neither of these suppositions are true, your first glimpse of Vulcan, 20 miles from Spalding, will be a surprise. Houses are built right up to the edge of the road, or street, and the street is so crooked that you are fortunate if you can see more than a block or two of it at any one time. Even the houses—miners' abodes—are peculiar in construction. If you were suddenly dropped down in Normandy, or Flanders, you could find nothing more unique or unexpected.

Iron Mountain the Hub of Iron Industry.

As might be expected, Iron Mountain is the hub of the iron industry in the Menominee range. It is a typical mining town of the better class. It is not so very much unlike the mining towns of Colorado that are best known, Leadville,

into the valley, crossing and recrossing numerous trout streams, with an occasional view of a beautiful lake or bathing pool for deer, on and on through densely shaded stretches of awe-inspiring silence, for the axe has never touched this enormous tract of timber except for the four-rod blazed trail that connects the east with the west of Cloverland. Deer, rabbits, porcupines, gophers, squirrels, partridge and countless other varieties of birds are seen with ever-increasing frequency as you go deeper into this forest primeval.

The Gogebic Iron Range.

After Watersmeet you approach the Gogebic iron range, which differs but little in topography from the Menominee, but which has its own compelling interest. Lake Gogebic has a host of friends and its converts come back year after year. Countless lakes and streams can be found where the camper may revel in his favorite sports.

Ironwood, Bessemer and Wakefield are the triumvirate of cities that dominate the Gogebic range. Each is different than the others, yet all have the same ambitions. Some of the wiseacres predict

might dispute Houghton's right to stand at the head of the class in the copper country.

Houghton county, as a whole, has a fine system of highways, mostly made of stamp sand—the crushed rock coming from the stamp mills when the copper is removed from it. This stamp sand varies in size from about half the dimensions of a pea down to a breath tablet that was popular with some people before July 1, 1919. All of this stamp sand having passed over the tables at the mill and the copper having been washed out of it silt and dirt is not found; therefore, the stamp sand makes an almost dustless roadway, its gray color being very restful to the eyes and the surface being equally restful to the body.

Beauties of Keweenaw County.

To the north of Houghton lies Keweenaw county. From the most northern point of Michigan, Keweenaw Point, the various rock formations emerge in bold, stair-like cliffs, exquisitely colored and affording many scenes of wild and picturesque beauty. This peculiar physiognomy is characteristic of the whole copper region, but the Keweenaw division has been fortunate in obtaining the masterpiece of nature's alchemy in the range. In height the range varies from 500 to 800 feet above Lake Superior's surface.

If you ever have seen Battle mountain from Red Cliff, the first town of consequence on the west side of Tennessee Pass, on the way to Glenwood Springs, Col., you can appreciate the vivid colorings of sections of the Copper range. I shall not attempt to tell you what the colors are, except to say that the vivid hues depicted in views of the Rockies that most people believe are the wild hallucinations of pseudo-artists rather than a portrayal of the actualities of nature, are here in volume and vividness. Piled up like a child's house of blocks, much of the rock appears to be disintegrated and there are many deep cracks, both horizontally and perpendicularly, and the cliffs bid you stop and study.

To the far north, near Eagle Harbor, is a figure formed by nature sitting enconced in a niche in the rock about 200 feet above the roadway. Legend says it is an Indian maiden who sits waiting for her brave of the Chippewas, who left her to fight their crafty foe, the Huron. Perhaps you may have to call upon your imagination for assistance, just as you have to do in the famous Garden of the Gods where nature has fashioned peculiar forms in the sandstone rock—forms that have been photographed and written about for years and which still find their way into the public prints.

At the tip end of Keweenaw is old Fort Wilkins, now abandoned, which was built in 1844 as a protection to the whites against the Indians. This was when Copper Harbor, adjacent, was a thriving mining town and the copper capital of Keweenaw.

Many examples of Goldsmith's "Deserted Village" can be found in Keweenaw, relics of by-gone days when copper towns sprang up over night. What is there of historical interest in Keweenaw, you ask? Much! At Eagle Harbor the ritual for the Knights of Pythias order was writ-

ten by Justus H. Rathbone, pioneer school teacher, who received his inspiration from the story of Damon and Pythias. The little school house where the ritual was written is still preserved. At Eagle Harbor also is the first church built in the Copper country. At the abandoned town of Delaware Mine once stood the cabin of Horace Greeley, where he lived while writing articles for the New York Tribune. His writings were dispatched to the Green Bay, Wis., railroad terminal by dog team, that being the only means of communication in those days.

Fine highways, wonderful scenery, ideal camping spots, nature at her finest—such is the Keweenaw country.

The Marquette Iron Range.

East of Houghton and Keweenaw is Lake Michigamme, the Marquette iron range, where iron was first discovered at Negaunee, and the city of Marquette, known as the "Queen City of the North." The Marquette country is one of the most attractive sections of Cloverland, in fact, of the Great Northwest, of which Cloverland is a part. Seldom has nature compressed into approximately 1000 square

A beautiful drive skirts the edge of this almost-island. You are admonished to drive slowly as a precaution against injury to the many deer that make their home here; that are so tame they will come to the side of your car for such choice bits of sweets as you may have.

Munising the Place of the Island.

Some 60 miles east of Marquette is Munising, the "place of the island." Three or four miles off Munising is Grand Island—grand in size, grand in setting, grand in scenery, grand ad infinitum. If space permitted many are the stories that could be told about this island that now is the king of summer resorts; that once was peopled by Indians and fur traders. Here you can see the only white deer known to this continent, if not in the whole world. Here they will show you a mounted specimen of wolf with a strange history—this denizen of the forest, an enemy of other game, especially deer—became obnoxious and efforts were made to hunt him down. He matched wits with 30 men for 30 days before man triumphed over him, but it is a long story of which you can learn the details when you visit the island.



Ruins of Original Blast Furnace at Fayette in the Manistique Region.

miles such a vast variety of level plains, lofty and rugged hills, approaching mountains in size, countless streams and inland lakes, all so blended as to give the acme of pleasure to the eye. Father Marquette should come back today and see the city and surrounding country that stands as a monument to his illustrious career in the North country.

Marquette has its Presque Isle, meaning "almost an island," which never fails to please the visitor. It is the city's playground, jutting out into Lake Superior. This mushroom-shaped peninsula, once the rendezvous of the redskin, now invites the tourist and pleasure seeker. Here nature is undisturbed, game is protected and the only destroying element is the pounding surf of Lake Superior. Occasionally you see an aged Redskin, who loves Presque Isle and who does odd chores for the keeper of the park and game preserve. This old patriarch of a race rapidly becoming extinct, remembers the days when the tepee was pitched on Presque Isle; when the kaleidoscopic colors of the chiefs in full dress might be seen here at will; when the dense woods here resounded the beat of the Indian tom-tom.

The western end of the pictured rocks are but a few miles east of Munising and may be seen from Grand island. However, the view you get from the island will not be satisfying; you will want to get close and study the peculiar formations and wierd colorings.

Roundabout Munising is much that will appeal. The boulevard roads, numerous waterfalls, beautiful, rugged scenery, mammoth trees, a variety of game and fish all call with insistency. In Munising you will want to visit the paper mills, where both wrapping and writing paper are made. Observe the water mark in your stationery; if it reads "Munising Bond," it was made in Munising.

As you get into the eastern end of the upper peninsula you will find the intimate history of the state which you learned in school more prevalent. Longfellow, Marquette, Schoolcraft, John Jacob Astor and countless others have left their footprints on the eastern end of the peninsula. Nor is it history alone that will hold your interest. Scenery of a different kind than you see in the western part of Cloverland, but just as interesting, is to be found everywhere.

Manistique with its big spring, known at Kitch-iti-ki-pi, its manufacturing, its lakes and streams, will be interesting. Probably your greatest interest will be displayed concerning the big spring, which has no counterpart to my knowledge. Four hundred feet across and 75 feet deep, with waters so clear that you lose the sense of floating on its waters, but rather seem suspended by some invisible means. Kitch-iti-ki-pi is a world wonder. The water is so cold that nothing can live in it. A frog thrown into the middle of the spring will stiffen and die before it can reach shore. There is an interesting Indian legend concerning the spring and how it came by the name Kitch-iti-ki-pi, but that you can learn from anyone who lives in Manistique.

Escanaba and the Fayette country, formed by the various deltas dipping down into the north end of Lake Michigan, will interest you from a farming, lumbering, scenic and historical viewpoint.

To the east of Manistique and somewhat to the north is the Soo, home of the greatest inland waterway in the world. More tonnage passes through the mammoth locks at Sault Ste. Marie in a season than passed through the Panama canal the first three years of its operation. Due to the great locks, the gate-man controlling them has but to turn his hand and the United States takes a new place among the nations of the earth. As a direct result of this easy step, enormous pits deepen in the Mesaba iron range; a hundred thousand farms spring up on the western prairies. The flour ground yesterday at Duluth and Minneapolis finds a waiting market a few days hence in London, Amsterdam and Rome. Bread is cheaper in a multitude of foreign and domestic homes because of this canal and lock system; it lessened the cost of the home itself. The copper ingots freighted through last year are now transformed into humming cables in far away Ceylon, or trolley wires in Siam, or armatures in Egypt. The native of the Orient spans his ravines with bridges made of the cheaply transported ore now passing by; these narrow walls of the locks made Pittsburgh and Gary possible; our mighty ironclads sailed this inland waterway before they sniffed the salt air. The locomotives of Brazil rode over these sills and so did the rails that bear them.



Point on Grand Island Once Used by a Moving Picture Film Company.

The Blue Laurentian Mountains.

Across from the Soo the blue Laurentian mountains in the Dominion can be seen in the haze; within the St. Mary's river is Sugar island and numerous smaller islands all of which appeal; the surrounding country grid-ironed with excellent roads, bids you visit the most remote parts of the county. Here timber and agriculture vie for the lead in industry.

To the south is St. Ignace and Mackinac, playgrounds of the western world, yes, of the whole country. There are many islands, but only one Mackinac. The struggles of the United States, France, Great Britain and the Indians pivoted about this remarkable island lying at the junction of Lakes Huron and Michigan.

Occasionally there lingers on the screen of memory a certain scene of which we like to dream; of which we dream unconsciously. There may be many other pictures that come and go, but this one is our own private masterpiece. Cloverland, since I saw it for the first time, has been crowding to the background a memory picture I set down as a masterpiece some years ago. I once voiced the opinion that Colorado was nature's rendezvous. I must now qualify that statement by admitting the possibility that nature has a rendezvous in Cloverland, the second one being equal

to the first, if not superior. I can account for it in no other way except that nature must be leading a dual life with two homes which she has arranged to her own special liking. Colorado or Cloverland, who shall say of which she is more fond?

ITINERARIES.

Menominee-Escanaba, Mich.

| Miles | | Miles | |
|-----------------|------|-----------------|------|
| Menominee..... | 0.0 | Powers..... | 40.7 |
| Wallace..... | 5.7 | Spaulding..... | 41.5 |
| Ingalls..... | 15.0 | Wilson..... | 45.1 |
| Stephenson..... | 21.0 | Bark River..... | 51.4 |
| Nadeau..... | 35.0 | Escanaba..... | 63.5 |

Escanaba-Marquette, Mich.

| Miles | | Miles | |
|------------------|------|-------------------|------|
| Escanaba..... | 0.0 | Yalmer..... | 56.3 |
| Gladstone..... | 8.0 | Green Garden..... | 58.3 |
| Masonville..... | 13.4 | Harvey..... | 63.4 |
| Rapid River..... | 15.1 | Marquette..... | 67.4 |
| Trenary..... | 35.1 | | |

Escanaba-Munising, Mich., and Pictured Rocks.

| Miles | | Miles | |
|------------------|------|---------------|------|
| Escanaba..... | 0.0 | Osler..... | 27.4 |
| Gladstone..... | 8.0 | Trenary..... | 35.1 |
| Masonville..... | 13.4 | Dixon..... | 37.8 |
| Rapid River..... | 15.1 | Hallston..... | 67.6 |
| Stegam..... | 26.2 | Munising..... | 71.5 |

Escanaba-Newberry, Mich.

| Miles | | Miles | |
|------------------|------|-----------------|-------|
| Escanaba..... | 0.0 | Isabella..... | 37.7 |
| N. Escanaba..... | 2.6 | Thompson..... | 58.6 |
| Gladstone..... | 8.2 | Manistique..... | 65.1 |
| Kipling..... | 10.0 | White Dale..... | 77.7 |
| Masonville..... | 13.1 | Blaney..... | 90.2 |
| Rapid River..... | 15.0 | Germantask..... | 99.2 |
| St. Jacques..... | 26.7 | Newberry..... | 125.2 |
| Nahma..... | 33.1 | | |

Newberry-St. Ignace, Mich.

| Miles | | Miles | |
|---------------------|------|-----------------|------|
| Newberry..... | 0.0 | Brevort..... | 42.7 |
| Hendricks' Q'y..... | 13.7 | St. Ignace..... | 65.2 |
| Garnet Station..... | 21.4 | | |

St. Ignace-Sault Ste. Marie, Mich.

| Miles | | Miles | |
|-----------------|------|-----------------------|------|
| St. Ignace..... | 0.0 | Sault Ste. Marie..... | 62.5 |
| Pickford..... | 37.7 | | |

Menominee-Iron Mountain, Mich.

| Miles | | Miles | |
|-------------------|------|--------------------|------|
| Menominee..... | 0.0 | Loretto..... | 56.9 |
| Powers..... | 40.6 | Vulcan..... | 60.6 |
| Hermansville..... | 44.6 | Norway..... | 62.0 |
| Cedar..... | 50.5 | Quinnessee..... | 66.2 |
| Waukegan..... | 53.5 | Iron Mountain..... | 70.6 |

Iron Mountain-Ishpeming and Marquette, Mich.

| Miles | | Miles | |
|--------------------|------|----------------|------|
| Iron Mountain..... | 0.0 | Republic..... | 44.1 |
| Twila Falls..... | 4.0 | Humboldt..... | 51.8 |
| Granite Bluff..... | 8.0 | Clarkburg..... | 53.9 |
| Randville..... | 10.7 | Ishpeming..... | 62.6 |
| Channing..... | 21.9 | Negaunee..... | 65.9 |
| Floodwood..... | 29.9 | Marquette..... | 78.0 |
| Witbeck..... | 37.9 | | |

Marquette-Escanaba, Mich. (Via Gladstone.)

| Miles | | Miles | |
|-------------------|------|-----------------|------|
| Marquette..... | 0.0 | Osler..... | 40.0 |
| Harvey..... | 4.0 | Stegam..... | 44.5 |
| Green Garden..... | 9.1 | Masonville..... | 54.0 |
| Yalmer..... | 12.1 | Gladstone..... | 59.4 |
| Skandia..... | 14.1 | Escanaba..... | 67.2 |
| Trenary..... | 32.3 | | |



Ore Dock at Escanaba.

A Tip to the Tourist

Strict Attention to Oil and Lubricating Directions Given by Manufacturers Will Do Much to Make Tour Enjoyable—Drain Oil as Directed Removing Thinned Oil and Water at Proper Intervals

FACTORY instruction books all warn the motorist to draw off the oil from the engine crank case oil reservoir at the end of the first 500 miles that the new car is driven, again at the end of 1000 miles of use and thereafter every 2500 miles. There are several reasons for this advice and the motorist, by

large amount of unburned fuel to become mixed with the oil and thinning results.

Changing frequently holds the body or viscosity of the oil at the correct consistency and provides proper lubrication for the wearing parts of the engine.

Water Enters Oil from Several Sources.

At first thought it is hardly conceiv-

are not drawn down sufficiently tight. Leaky core plugs in the water jackets will allow water to enter the cylinders. Leaving the car standing during close, muggy weather, will cause moisture to condense on the inside of the cylinder walls and drip down past the pistons into the base, or it may enter around the enclosed valve mechanism if the cover is not fitted tightly, passing down through the oil spray holes into the base.

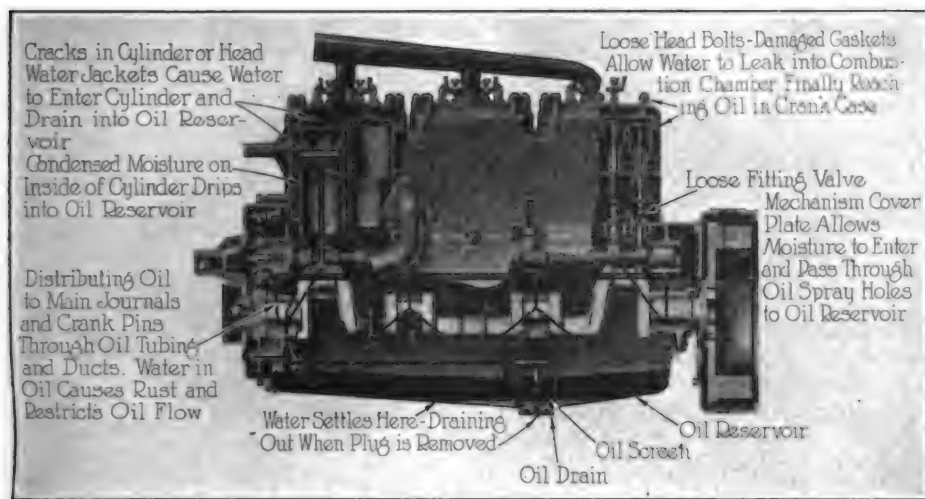
Cracks or blow holes in the cylinder will also allow water from the jackets to enter the cylinder block and mix with the oil. All external water leaks about an engine should be watched and stopped as soon as they appear, lest the oil be contaminated.

If an engine, which ordinarily requires considerable additions of oil to maintain the crank case level, suddenly seems to be using no oil, the probability is that water is entering the lubricating system and maintaining the level.

When the crank case level rises instead of falls—an actual happening at times—water is undoubtedly finding entrance and the cause should at once be determined and removed.

Although the water does not mix noticeably with oil, while at rest, when the two liquids are violently beaten together, as when the engine is in operation, an emulsion is formed, and this is a very inferior lubricant. The best oils emulsify less than the poor oils, but even those of excellent quality develop a thick, curdled material, which is likely to obstruct the fine oil passages and is of little lubricating value.

(Continued on Page 23.)



Sectional View of Six-Cylinder Engine Showing Where Water May Possibly Enter, Eventually Draining to Bottom of Oil Reservoir.

following instructions implicitly, finds that engine troubles connected with the lubricating system are reduced to a minimum.

Two sources of oil trouble tend to thin the oil in the engine reservoir, one being the entrance of unburned fuel, which is composed of a heavy percentage of kerosene and the second water that enters the oil in the original container, barrel or tank and is drawn off from the bottom with the oil.

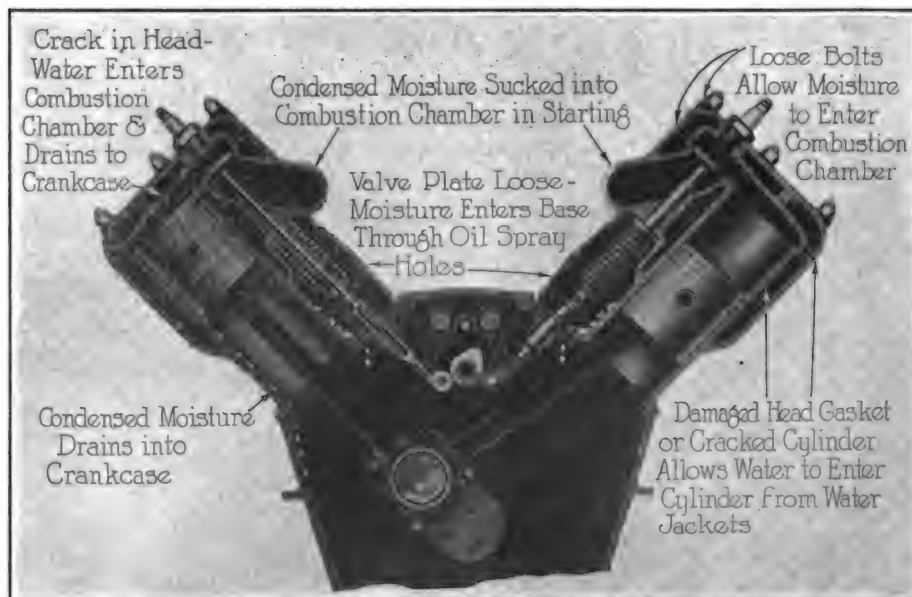
The reason for drawing off the lubricating oil at the end of the first 500 miles is that the engine as it leaves the factory has all of its parts fitted tightly. During the first 500 miles of road travel the parts limber up and the engine oil takes the excess metal from the wearing parts and deposits it in the oil reservoir. Continued use of such oil causes the parts to wear faster. Draining the oil and refilling tends to hold this wear down to a low point or until the engine parts smooth up properly.

After the car has been driven approximately 2500 miles, the parts are worn to a glass smoothness and further wear is negligible provided that the oil is changed every 2500 miles.

Starting the engine cold with the choker pulled out all the way supplies a heavy charge of raw gas to the engine and causes the unburned gas to blow down the cylinder walls around the pistons and enter the oil in the engine base. Continued use of the choker causes a

able that water can enter the lubricating system in large enough quantities to do any harm, but such is the case, as has been proved in several instances.

There are several ways in which water may enter and eventually cause trouble. It may enter the combustion chamber through a defective head gasket if the gasket is damaged, or the holding nuts



End View of Eight-Cylinder Engine, Showing Possible Sources of Water Which Will Eventually Reduce the Viscosity of the Oil.

Road Rules for the Tourist

Responsibilities of Automobile Driver More Marked Today Than Ever—One Person in Every Eleven Now Owns Car—Increased Road Congestion Demands Rigid Attention to Rights of Others

IN OLDEN days a youth of noble blood mounted his horse and with another noble youth as esquire roved the highways of the world, seeking to rescue the weak, right the wrongs of the helpless and perform all the duties of knightly chivalry. They fared forth through Arcadian paths, and upheld by force of arms the ideals of their hearts.

The beginnings of the civilization of the Twentieth Century lay in the ideals of these knights and esquires, the "riders" of the Teutonic and Anglo-Saxon lands, the "cavaliers" and horsemen of Latin Europe.

These were the "gentlemen" of their age, and their mantle of obligation has come down to the gentlemen of today, their ideals and altruism, modified and softened by the centuries, build our code of etiquette that when practised, raises each man now-a-days above the level of his fellows, and wins him the title "gentleman," and all may have "nobility" self-conferred.

And there are "riders" today—in America and all over the world—but they drive steel steeds here, there and everywhere. They are our men and women of wealth and position; they establish the standards of our manners and our chivalry. Our city's streets are becoming black with their ranks, that spin 9,000,000 strong on the roadways of America. A half million dollars and a few daring spirits in 1899 have waxed today to two billions of capital and countless legions of folk who plan, make and minister to this newest and greatest force in moulding our affairs, the motor car in all its types.

A Message to the Knight Motorist.

This is a thought, a message and a plea to the knight motorist that he recall the obligations and ideals of his knightly prototypes of centuries long

ago, when noble youths won their spurs, and thought out and achieved high ideals. The motorist is the "rider" now, heir and descendant of the dim and misty cavalcades that people in memory the broad white roads to Paris, says the United States Tire Co., which has been fostering a movement for genuine courtesy among motorists.

be made, transported, sold and fitted on a car.

With all this stupendous cumulative activity can the driver recognize his share of responsibility to other drivers and to the public? Can he maintain for this giant industry the favor of the people? For it rests in his hands whether, with the rapidly increasing road congestion,

he will continue to be treated with cordiality. Today many cities must have elaborate traffic and policing regulations and the traffic is growing.

The careless driver, the thoughtless driver, the driver who does not force himself to be a "knight" and "gentleman" will greatly increase the danger of motoring to the pedestrian, to other drivers and to himself, and jeopardize the privileges he has hitherto enjoyed, whereas if equitable practices are universally followed by drivers, motoring will maintain its safety, its freedom, its standing and its favorable acceptance by the community. Five years ago such suggestions as these were unnecessary. Today, when each 11th person owns a car, it is vitally necessary to have drivers recall the days of chivalry. Crowded and still more crowded streets and roads have produced a nation-wide problem whose simplest solution is a return to the courtesy of the

GOLDEN RULES FOR CHIVALROUS AUTOISTS.

1. Keep to the right of the road.
2. Slow down at crossings.
3. Signal for a stop or turn to the cars behind by holding out the left hand.
4. Apply brakes slowly. Change speed rates slowly. Drive carefully.
5. Be prepared to help any motorist in trouble on roads distant from garages.
6. Be prepared to give pedestrians "lifts" on country roads.
7. Stop car and engine when meeting drovers with sheep, swine or cattle on country roads.
8. Park only at side of roads, leaving fair way.
9. When buying produce in the country, park alongside road, not on the road.
10. When parking at night, leave warning lights.
11. Have headlight dimmers and use them when meeting and passing other motorists at night.
12. When picnicking, carefully put out picnic fires.
13. When picnicking do not trespass to gather wild flowers, tree branches, blossoms, fruit or shrubs.
14. When picnicking, clean up thoroughly, removing from sight all cans, papers and rubbish.
15. Give all vehicles, especially loaded trucks, a good half of the road.
16. Take hills on the right side of the road. Go over the crest carefully. Avoid coasting or speeding around curves at foot of hills.
17. Be courteous to pedestrians. Do not drive your car at them full tilt, and laugh when they jump. Do not splash water on them as they stand at crossings or near curbs, waiting for you to pass.
18. Avoid street cars carefully at stops.
19. Learn and follow the local traffic rules, speed limits and driving ordinances. These are made for the common good of all drivers, including yourself, and of all pedestrians.

Scrupulous honor, probity, generosity and all the high ideals of the days of knighthood have been brought into the giant productive industries that enable the motor car to transport each year in the United States the equivalent of carrying one driver 4,800,000,000 miles. Every 2000 seconds the motor car transports a rider from Augusta to Los Angeles. Day and night this lonely motorist travels at the rate of 9133 miles a minute. Each second of the year \$1.20 in tires has to

days when knighthood flowered.

The automobile is too vital to the nation, too much a part of the blood and bone of the country's economic life to have its use curtailed through the failure of its users to follow the rules of simple courtesy and safety.

This, too, is not altogether a matter of sentiment—it is good common sense and good business. The sowing of the seed of courtesy will be found to return results beneficial to the sower a thousand-fold.



THE wanderlust is the heritage of every true American. Urged on by its tense force he has ever hammered at the frontiers of civilization seeking new fields of exploration and adventure. For years his movements were subjected to the whims of horse flesh and steam train. Now this is all changed and for more than two decades he has been free to come and go as he chose.

He has followed the path of the pioneer, the emigrant and trader, the woodsman and the hunter. He has journeyed more miles between suns than did his forefathers in a month. Without haste he has crossed the Alleghenies to the fertile, flat-lying lands of the Middle West in less than a week's time. He has cast a line into the waters of a northern river in mid-August and before September has fished in the turbulent mountain streams of the National parks.

He follows at will the trail of the trapper, the Indian fighter and the soldier of fortune, speeding along at his ease in his swiftly-moving automobile. For him the western frontier has swept into the east and he knows no boundary lines except the rolling oceans to the east and west, and the ice of the frozen northland.

He is indeed fortunate who appreciates the broadened vision vouchsafed to him by the motor car, and doubly so when he takes advantage of it to the fullest as opportunity offers. This means that he has no use for hotels. Modern mechanical invention, added to native ingenuity, has made it possible for him to camp as he goes with less trouble than he would experience in finding good hotel accommodations.

All the world invites the motor camper this late summer and fall. Get busy and go.

"This Is the Life" Says the Gasoline Tortoise

*'Tis the call to the motor camper,
Let's hie away—
To dream
Near the stream,
In the woods for a day.
—Songs of the Tote-Road.*

CONTRARY to popular opinion, the average American is not extravagant. He is perfectly willing to spend, but he wants value received in return. That, in a great part, accounts for the fact that up to within the last two or three years there was a comparatively small amount of motor touring as compared with today. Touring was then done in terms of hotels. It was too expensive. The present day gasoline tent dweller is not only enjoying an infinitely better time, but he is having it at a fraction of the cost.

Almost every motor camper keeps an expense account. On the slightest provocation he will exhibit it, and this with gloating pride. Figures have many times been shown which prove that the total expenses of an all-summer trip are no greater than living at home. Such a statement may be subject to slight variations, but the writer believes that in the main this is true. Certainly a goodly portion of the army of motor campers now touring the length and breadth of

This story will make you want to close up the old desk, hang a sign on the office door and tune up the old bus for a two weeks' trip. It's no wonder that summer hotels throughout the country are reporting poor business. How could it be otherwise? The day of the summer boarder has passed. The hot, stuffy, high-priced hotel, that was frequently run by one who was a true blood-brother to Captain Kidd, has been relegated to the yesterday of time. The motor camp has taken its place. Every road, trail and cart path in this great country knows the motor camper from first-hand, intimate acquaintance. Trout stream and lake, mountain and valley—all have welcomed him to a well-earned rest. And the number of motor campers is growing faster than the census in a Chinese city.

the land are people who but for this inexpensive form of travelling would not be able to get away at all.

Motor camping offers more than one advantage to those who avail themselves of this mode of travelling. From an educational point of view, a vast fund of knowledge is obtained about this country of ours, that could not be gained by any other method except by a long and tedious process of study. One can study text books and gain an education covering any number of subjects, but who can remember from study how nature looks at her best. Who can picture, years after, just how a certain lake or mountain looked in the early morning hours just before sun rise? The study of books will not give this, but actually seeing it with one's own eyes will so impress the scene upon the memory that one can easily recall it in after life.

Pick up a sporting magazine on the news stand; glance through the pages and find a story described by some fisherman who has caught an unusually large trout, bass or other game fish. How long does the story remain with you? Not long as we know from experience—but catch the fish yourself while motor camping and I'll guarantee that you will have no difficulty in remembering the fact as



Delaware Water Gap, Looking Up River from Heights Above Kittatinny Hotel.

long as you live.

The beauty of motor camping is that the children can enjoy the trip as well as the older people of the party. Children store up many things in their young brains that escape older persons, and the out-of-door education which they receive from such a trip cannot be gained in any other way—to say nothing of the health question.

The Friendly Spirit of the Open Road.

Wherever motor campers gather the friendly spirit of the open road is manifest, and no matter what difficulty one may get in while travelling or camping at the many camping sites selected by the cities and throughout the national parks, he will find a spirit of cooperation among other motorists which is ever ready to extend a helping hand and soon he will be looking for opportunities to help others.

Public Camping Grounds for Motorists.

The public motor camping ground has become an institution in many western towns as firmly established as the post-office and public library. Very often it is located in a city park, and here the motorist sets up his tent and makes himself at home. Here he will find a 40-horsepower \$5000 car rubbing shoulders with a 22-horsepower Ford. Just what the stations in life of the respective owners may be neither inquires nor does either seem to care. The respective families are guided accordingly. They meet, play, exchange touring experiences by the common camp fire for a day or two and then pass on in opposite directions.

In all public camping grounds this writer has visited, the city supplies conveniences of various kinds. As a rule the camp is fitted with electric lights, hot and cold shower baths, laundry tubs, gas stoves and wood fire places. Santa Barbara has paid much attention to the tourist and hangs out a sign. "Cleanliness Is Our Joy and Pride." It supplies such varied items as waffle irons, electric washing machines, curling irons and nail files. Fully 50 other towns in southern California have camping grounds and in five western states there are more than 150. The movement is rapidly spreading eastward and the South has already gone into it in an extensive manner.

Seattle maintains a pleasantly located camp on the shore of Green lake, with plenty of boating and bathing close at hand. Dozens of other western cities offer similar attractions. Denver has

bought the grounds of an old race track which comprises a tract of 170 acres situated in a fine grove and has turned this over to the campers. The camping area is divided into 825 camp lots and city water pipes have been extended into the camp site so that no motor camper is more than 150 feet from a hydrant. Colorado Springs, in addition to its tent settlement, maintains a "cottage city." There are 56 small cottages, each having one and two rooms and kitchenette. Most any town in the West, and still more recently in Florida, hangs out a welcome sign for the motor camper.

Some campers keep steadily on the go while others find a spot that suits them and they camp for several days or a month, taking side trips daily and returning at night to the camp ground. A city like Denver, Col., for example, offers exceptional opportunities for all-day side

tor camping accommodations that are found in the western cities.

In the Yellowstone park there are at present 10 camping sites fitted with stone fire places, garbage disposal pits, piped water where necessary and similar conveniences. Forty more are planned. Horace Albright, Yellowstone park superintendent, reports that last summer in Upper Geyser Basin, near Old Faithful Geyser, a single camp ground of this sort was occupied nightly for weeks by from 800 to 1200 people. This general situation applies in a large measure to other national parks. The Yosemite, for example, was visited by 25,000 campers.

Records of the national parks tend to prove that such figures are not unusual. Last summer there were some 35,000 motor campers in the Yellowstone National park, and the hotels catered to poor business it was said.

The number of motor campers one finds varies in different sections. Proximity to main travelled highways usually shoots up the average. Fairly typical figures for the small city of 15,000 to 20,000 people might be those of Coeur d'Alene, Ida., for August, 1920. During the month there were a total of 1382 people encamped in the public camping grounds. They travelled in 439 cars, and among these were represented 36 different makes. The passengers came from practically every state in the Union, and this performance was repeated in other localities.

In the larger cities, the census takers gave up in disgust, the motorists came so fast. Denver, for instance, is unable to



Yellowstone Park Contains Samples of All the Beautiful Scenery in the World.

trips. The motor camper sets up his tent household in the camping grounds for perhaps a week, but sees it only in the early morning and at night. During the day the family are travelling through the surrounding mountain country.

Modern Camps in Federal Parks.

The federal government has been busy installing throughout many of the national parks much the same sort of mo-

give the exact figures, but a rough estimate of the number of tourists visiting the free camping grounds during the months of June, July and August last year is given at 20,000, and the total is proportionally larger this year.

From the foregoing one can easily see how popular this latest method of travelling has become and it is safe to say that this season of 1921 will find the above

figures greatly increased as motorists become more and more imbued with the spirit of Wanderlust.

Camp Grounds Very Economical.

The various city camping grounds are proving the most economical proposition that the tourist has ever come across in his travels. In many instances there is a nominal charge of 25 or 50 cents a day for each car but, as a rule, camping privileges and all the accommodations that go with them do not cost the motor camper a red cent. The city pays all expenses but, in view of the fact that the motorist is likely to do some trading in the community during his stay, the institution, from the civic standpoint, may be called a good investment.

Motor Vehicles Specially Fitted for Camping.

Now that the touring season is in full swing, one will be able to note many novel ways to equip the passenger automobile and motor truck for motor camping. The passenger car is put to the greatest number of uses, but the truck is finding favor as well. But it is in the trailer, however, that true comfort is found. There are two distinct kinds of trailer, speaking of the matter from the camper's viewpoint. One of these is the specially constructed camp vehicle, which is the epitome of all camping luxury. It is fitted with ice box, pantry, tables, chairs and stoves and has sleeping accommodations for several persons. The other is the commercial trailer that has been converted to camp use. These come in as many styles as the owners have ingenuity, and while a bit sketchy in appearance oftentimes, are very near as efficient as the specially-built camp outfit. The trailer is a boon to the camper. It leaves him the entire capacity of his car

chassis which is fitted with a small house-like structure, and having many of the home comforts, such as a kitchen, sleeping quarters and rear porch, and fitted with an oil stove, cupboard, tables, etc. From this type of travelling home the list will range through the converted motor truck of 2½ to 3½ tons capacity up to the specially constructed travelling bungalow on which the owner has spent many thousands of dollars in fittings and equipment. Many of the more costly outfits include running water, electric lights and a gasoline or electric range, the latter being operated from the electrical system of the car. There are several companies that build nothing but camping bodies, but whether the owners of the costly outfit get any more real enjoyment out of the trip than the owner of the Ford-equipped bungalow is a question.

Many touring motorists purchase a folding or sectional boat, which may be strapped to either the trailer or the side of the car. When camping near water the boat comes in very handy for fishing.

An instance was also noted by the writer at Bar Harbor, Me., where a finely appointed house boat, after docking, threw out a wide gang plank and a high-powered and expensive automobile was driven ashore. This party combined water and land travel without being dependent in the slightest degree upon other agencies than their own. But this sounds more like motor boating than motor camping.

Another practical method of touring is to combine two parties, one car carrying the passengers and the second car carrying the bedding, tenting and supplies. This method has much to commend it, in that all the campers, with the exception of the one driver, are carried in the car, making the trip much more pleasant than



Beautiful Trees Line the Roadways for Miles in the Lake Country.

are taking to the road, many of them for the first time, lured on by the glowing tales told them by their friends who toured in this manner last season and by many others who have taken trips this season. The novice who starts with the idea that he can pick a camp site that will be entirely satisfactory from his ex-



Lincoln Highway Near Green River, Wyoming, Sweetwater County. Green River and Castle Rock on the Right. A Western Waterway.

for passenger comfort, tows easily, puts little extra wear on the brakes of the auto, and surely is destined to play an ever-increasing part in the life of the motor tourist.

Camping with a Motor Bungalow.

You are sure to meet the motor bungalow tourist this summer regardless of where you go. This novel method of touring is on the increase in this country as well as abroad. You will meet the family with a converted Ford ton truck

if passengers and baggage were carried in each car.

And, incidentally, as a matter of economy, if economy is to be considered, the motor vehicles prove far less expensive than the railroad and hotel rates.

Motor Campers Avoid Hotels.

The motor camper has solved the hotel problem to his own satisfaction by pitching his tent in the most convenient spot he can find when night overtakes him. At this time of the year camping tourists

perience gained by listening to others, will find that a one or two weeks' trip will teach him differently.

Choosing the Camp Site.

In picking a camp site for the night or for several days one should leave the beaten paths of travel, choosing a side road if possible. Proximity to a large body of water is desirable if the stay is to be of several days' duration. Choose a spot that is high and will be dry, as sudden summer rains are likely to occur. An

eastern exposure is best and one should not make the mistake of pitching the tent near the water in long grass, for the grass is sure to be the abode of hordes of mosquitoes that will disturb the night's rest.

The amateur is very prone to set up his tent beneath the shade of a grove of trees. At first glance this seems a perfectly logical spot for the camp, but in practise it works out disadvantageously, as the tent is always damp and soon becomes mildewed, to say nothing of the discomfort of sleeping in blankets that are always clammy. The best place for the tent is directly out in the open where it will get the full benefit of the hot sun and the drying breezes, but a compromise can be made by so placing it that the morning sun shines on it, drying it thoroughly, moving around to leave it in the shade during the afternoon.

PRACTICAL HINTS FOR MOTOR CAMPER.

1. As a general rule, the camper should wear loose, old clothes; also, outer garments of woollen as a protection against cold because it absorbs perspiration and protects the skin against drafts; but do not wear the woollen garment next the skin. Wear cotton or linen garments under the woollen ones. Army woollen shirts, loose at the neck, are excellent for men and women. Every one should have a sweater along and some kind of a water-proof overgarment. Khaki, olive drab and gray shades are most serviceable. Around camp use camp moccasins or light shoes—slippers are tabooed. Use boots or shoes with leggins, but do not take new shoes along; only the worn and comfortable ones. Foot wear should have heavy soles and hosiery should be of wool and heavy.
2. A cap with visor or a medium-brimmed hat is recommended. If one outfits specially for a motor camping tour a corduroy suit or a golfing jacket with breeches are

very comfortable, or in the warm months a khaki or olive drab worsted suit. Breeches and a three-quarter length coat are very practical for women. As nights are cold in high altitudes warm clothing is essential in such regions.

3. For working round the car and camp a pair of overalls will be appreciated by the men, and the women will find an enveloping apron more than useful.
4. A one-piece sleeping suit of cotton flannel with detachable hood and feet is very comfortable and in cold weather a woollen one-piece sleeping suit of light material with head piece attached, or

Great, luxurious touring cars, "tin cans," converted trucks—all are joining the procession. Incidentally, the trailer, "the drawing room car of the open road," is growing in popularity and one sees them in every form from the small two-wheeled affair that carries the bare necessities of camp life to the great self-steering four-wheeler that contains the making of a permanent home wherever night overtakes the traveller. It's a wonderful life. You'll say so too once you have pulled out the old flannel shirt, the hunting jacket and well worn cap, selected the necessary fishing tackle and other camp stuff and joined the gang. Try it. And, by the way, don't try to hustle. Take it easy—and rest. Tommie Milton has taken care of the speed problem.

with a detached sleeping cap.

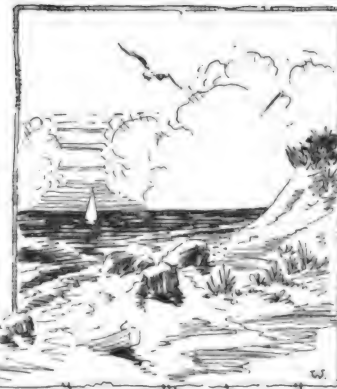
5. To those who do not count the cost, a leather coat, short or long according to taste, or a leather vest, may be recommended.
6. Amber goggles or large glasses with timber lenses will be found almost a necessity when travelling in some regions of the West where the light is high and glaring.
7. Mosquito veiling will be frequently found a great comfort.
8. Each person of a camping party should be confined to one suit case. All extra clothing should go into duffe bags.
9. Especially do not forget the handkerchief, tooth paste, tooth brush, comb, a small mirror, safety razor, soap, a bachelor's comfort kit with some safety pins, coarse needles and linen thread, some bachelor's buttons and a stout two-bladed pocket knife.
10. The side of the main travelled road is to be avoided wherever possible, as the constant all night travel is very annoying. Fresh supplies are easily obtained along the route, such as eggs, milk, fresh vegetables, etc., from nearby farmers. Speaking of farmers, it is a good policy, if camping on a farmer's land, to first obtain his permission. Previous experience may have left him with small respect for campers, and by asking his permission it will show him that you realize that he has something to say in the matter.

Few campers after their first trip are content to use the hotels for future travelling, but join the ranks of the thousands of enthusiasts who like outdoor life and are willing to put up with a few discomforts. Certainly this method of enjoying a summer's vacation cannot be excelled. It is sure to improve the health, broaden the vision and give new life, which is impossible if the motorist follows the beaten path—LET'S GO.





Auto-Suggestion Sells Auto-Accessories



(By S. G. SWIFT.)

BUSINESS could have been better than it has been for the last month," admitted the accessory dealer, answering the question put to him by the tire salesman. "I've tried about every way possible to get 'em biting," he continued, "but for some reason or other they don't seem to be interested in what I have to offer; that is, there hasn't been any unusual activity, although, of course, I've done a pretty fair business."

"Have you worked your display windows to the limit?" asked the salesman, making a mental total of the order just given him before replacing the order book in his satchel.

"I've learned that the real secret of selling accessories lies with their proper display. And there are a lot of different ways to handle displays, too. I've also learned that. I've probably paid more attention to the displaying of accessories than any other man travelling the road today. I don't believe there is a window in my whole territory that I haven't seen and carefully analyzed," he continued earnestly.

"I've studied all the trade papers and, believe me, that's where you get the good ideas, too—and, well, I've made it a hobby. The window of an accessory store attracts my eye just as unconsciously as the spectacle of a chicken crossing a street—I mean, getting on a street car—and I've been what you might call a mental window trimmer for the last three years.

"Therefore, when you say that business is only fair, I am interested, because I believe that I can show you a way to make it better. Not that I mean to preach, of course," he added hastily.

He was well acquainted with the dealer, having known him a long time; still he was somewhat fearful lest in his enthusiasm he had gone rather too far in offering unasked advice. But the dealer was duly appreciative of the salesman's interest, and intimated as much by asking, "What would you suggest that I do to bring about this change? I'm always willing to take counsel from those who are qualified to give it, intelligently, and I believe you are because of the interest you show. What's the proper way to get 'em coming in, stead of going by? Some of 'em stop to be sure, but the great majority just look in and pass along—unless they need something real bad.

"The first thing I want to know," answered the tire salesman, "is whether you have the name and address of every au-

tomobile owner in this city. You should have some sort of a prospect list to start with."

"I've got it, too," said the dealer, reaching into the top drawer of his desk. "I was looking at it only a few days ago with the idea of sending out some sort of a form letter to the automobilists in this territory. We've not such a large city, but we've got a live chamber of commerce, and they furnish us with about all the information that is necessary for us to carry on sales campaigns; although I don't suppose many of the merchants pay much attention to it," he said in after thought.

"I'd be willing enough to, but I never could think of just what to do along that line." "Right there's where I can help you," said the tire salesman as he skimmed rapidly through the list of names given him by the dealer. "This is a mighty complete list, and apparently is pretty well up to date. It'll answer my purpose fine. Now the next thing you want to do is to get in with some hardware dealer who handles a lot of camping material. You want to get a tent, a few cooking utensils, a folding camp table, a couple of camp chairs, a thermos bottle and a double cot. Now I wonder if you've got room for half of a canoe in your window?"

"For the love of mud, what sort of an idea are you planning?" interrupted the dealer, amazement expressed in every line of his face. "A 'half of a canoe'—say, what kind of a joint are you going to make out of this place? Sounds like a layout for a G. A. R. encampment week. I suppose you'll ask me to put up a sign saying 'Welcome Veterans,' the next thing. What's the big idea?"

"Never mind now. I'll get to that later. How big is your window? You promised to listen to me. You asked for the information, you know," laughed the tire salesman, enjoying the puzzled look of the dealer. "You want to remember that there are a good many ways to move goods. Maybe I can show you one you haven't thought of."

"All right, shoot ahead," snapped the dealer, reaching for a cigarette from the extended box. "My big window on the front—takes in the corner, too—is about eight feet deep by, well say, 15 feet wide or long, however you call it. It'll hold a half of a canoe easily enough," he grunted sarcastically.

"All right then," nodded the salesman, who had been busily writing a list of the articles needed. "Now then, that's all you want from the hardware dealer. Think you can get hold of it?" he asked.

"Certainly can," answered the dealer. "Got all of it at home. Won't have to borrow it from any competitor."

"All the better," said the other. "It'll be well-worn probably and that makes it all the more effective. Now, having got those things, you next want to get a few magazines, a pair of rubber boots, some fishing tackle, and perhaps a bathing suit. You'll also need a pair of blankets. Then you want to take your speed wagon and go out into the country and cut down some small trees, most any kind except dogwood—get hold of a few bushels of green moss, and about a peck of burned wood and two or three blackened rocks that some one has used in a camp fire. You also want an old canoe—don't care how old it is."

"That's easy," said the dealer. "I'm beginning to get you now, although, to tell the truth," getting serious again, "I don't see just what camping has to do with the sale of accessories."

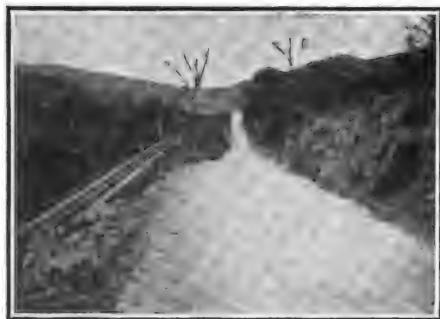
"You will when I get this window trimmed," promised the salesman.

"Now there are just two more articles you need—a large piece of mirror and an old smoke-blackened cooking pot. You get those things together by 9 o'clock to-night and I'll be back from seeing my dealer over in Auburn and we'll get that window trimmed. No back talk now," he laughed as the dealer started to speak, "—I've written the list on this sheet of paper. All you've got to do is to get what I want and I'll guarantee that what I'll do to that window will bring in trade for both of us.

"See you later," and taking his hat and satchel, the salesman vanished. A moment later and the whirr of a smooth-working, self-starter, gave noisy evidence that he had started for the neighboring town.

He was back promptly at 9 that evening. The store was closed, but he gained admittance by tapping on the door and went in to be greeted by the dealer, who guarded a miscellany of objects piled in the middle of the floor. Boots, moss, trees, a tent, they were all there, even to the canoe. This proved to be a very old one, and the stern gave evidence of a violent quarrel with a rock at some time or other.

"Just got the window cleared out,"



greeted the dealer, who now appeared as enthusiastic as the salesman. "What's the first thing on the programme?"

"The first thing I'll want," answered the other, rapidly divesting himself of his coat, "is the tent. I'll get into the window and you pass the things in to me."

"Best one I've struck," he said a moment later as he stood in the window. "Just the kind to hit 'em right in the eye if it's trimmed right, and I don't mind saying that I can trim it properly. Hand me that tent and I'll proceed to prove my statements," he boasted jovially.

The tent was soon set up, about half of it projecting into the window, and the rest out over the sales room floor. "That's fine. Now pass me the bow of that canoe," requested the salesman, and the dealer who had been busily engaged in sawing a few feet from the bow of the craft, passed it in to the other, who placed it at one side of the window.

He next put the blackened stones and the burned wood in the center of the window, and arranged the cooking pot on a hanger over it. This done he threw back the flaps of the tent, carpeted it with a convenient piece of matting and arranged the cot inside, draping the blankets over it in careless fashion.

The boots and the fishing tackle were placed beside the front door and the table and chairs were arranged in front of the tent. The cooking utensils and the other things were carelessly placed around near the entrance to the tent and everything was so situated as to be plainly visible from the street.

The salesman's next move was to place the large mirror on the floor slightly back from the canoe, with the bow of the canoe resting on it.

"It doesn't look like much yet," he grinned, "—but it will in a minute." He spoke truly, for when he had strewn the floor with moss and arranged the trees all around the back of the window the whole place was transformed into the coziest camp imaginable. The canoe appeared to be sticking out through the trees, the looking glass, nearly concealed, was enough like water to satisfy the most critical, and there seemed to be a winding path leading out through the thicket. As proof of the attention-compelling quality of the display, the dealer raised the curtain that had been drawn during the trimming of the window and though it was then nearly midnight, the window was immediately surrounded by an appreciative crowd within a few minutes after the curtain had been drawn.

"That suits me fine," announced the salesman, as he accompanied the dealer back into his office after standing with

the crowd on the street for a moment—"and now we'll get busy with the announcement cards that tie up with the window. First off, I'll explain my plan more in detail. I'll make my explanations by asking you questions. First, what does the window suggest to you?"

"It reminds me of taking a trip out into the country, and I wish I had the time to spend to do it, too," said the dealer, lighting a midnight cigar.

You can go a step further than the dealer in this story did by making your accessory store **AN INFORMATION BUREAU FOR TOURISTS AND CAMPERS.** Get good maps and study them. Keep a stock on hand and sell them. Find out the location, elevation, bathing and fishing conditions of the best vacation lands. Get accurate information as to roads and trails leading there. Take pride in being able to supply this information at once.

This is the touring season. Your efforts will be appreciated by persons who want to know where to go to have a good time. The hunting season will soon be along. Get a few pertinent facts regarding the good shooting territories. Have the state laws on hand so that the man who wants to know what his hunting license in Maine, New Hampshire and other favored gunning resorts will cost him can be told.

These facts will take a little of your time, but think of the great amount of "word-of-mouth" advertising you will receive. It will be rather nice to have your store known as "Information Headquarters for Vacationists"—incidentally, it will be mighty profitable—and that won't make you mad either.

"I've been thinking how cool the waters of a lake I know of would be about this time. Be great to crank up the old bus and beat it out where the bass are biting," he said with a sigh. "Speaking of fishing, did you ever try a 'basserino' for catching small mouth bass? It's the—"

"Far enough," laughed the tire salesman. "It's working better than I dreamed it would."

"What do you mean?" asked the dealer innocently enough.

"I mean just this," grinned the other.



"That window makes people think of camping doesn't it?"

"Certainly," answered the dealer. "It sure puts out-door thoughts in their mind."

"How do they go on a camping trip nowadays?" the tire man wanted to know.

"Why I'd go in the old machine myself," answered the dealer, and then he saw a great light. "Now I've got you," he chuckled. "Sure is a great idea, too. The scheme is that the window gives people a hankering for the out-doors. They want to go camping and naturally they go in their automobiles. And they wouldn't start on a long trip to be gone a week or two without taking along a supply of accessories for the trip. I'll admit I didn't quite get you at first, but now I'm three jumps ahead of you."

"You must be one of those 'psychologists' I've been reading about," he finished. "I s'pose your idea is to make out some announcements for the car owners, telling them about the window display and suggesting that they come here for their automobile accessories; their tires, tubes, oil and all other things they'll need when they take the trip."

All doubt in the dealer's mind as to the feasibility of the plan was soon dispelled. It was successful from the start. Within a week he was telephoning his orders for more stock. He not only did a rushing business in general accessories, but his line of camp trailers began to move in good style, and he sold 14 before the rush subsided.

The majority of those who bought were owners to whom he had mailed his announcement cards, but he also did a good business with persons he had never thought of as prospects. Incidentally, and to my mind this is the best part of the story, he kept in close touch with his new customers and has their trade to this day.

This is a true report of an actual occurrence and one that needs no further detail. But there is another fact in connection with the whole thing that should be told. It has to do with the tire salesman. He knew just what he was doing when he helped the dealer stimulate a dull market. He had worked the stunt before—to his own advantage. It worked the same way this time, because the dealer's tire account doubled and the salesman got the business. All of which shows the high value of constructive salesmanship, even as much as it illustrates the worth of "intensive cerebration," which means, applied thought, as I dope it out.

Touring In a Redwood Tree



(By ALBERT MARPLE.)

OF ALL the transcontinental outing outfits that have ever been devised the one shown in the accompanying illustration probably deserves the blue ribbon. This machine has been termed the "big tree car," on account of its body being made of a portion of the trunk of a giant redwood tree from California.

The owner of this unusual machine is Charles Kellogg of Santa Clara, Cal., who, on account of his wonderful bird-like impersonations, if we may use the term, is known as the man with a throat like a bird. Mr. Kellogg is an ardent lover of nature and spends most of his time, when not on the vaudeville circuits, out in the open and among the birds, by which practise he has become acquainted with the customs and peculiarities of his feathered friends.

Some time ago Mr. Kellogg conceived the novel idea of taking a section of a huge redwood around with him on his travels. An especially prepared chassis and motor were built for the proposed wooden house, and this was shipped to the Kellogg ranch, near the foot of Mt. Hamilton, 20 miles from San Jose. In this truck Mr. Kellogg and his wife journeyed to Scotia in the El river country, where they secured from a lumber company a section of a large redwood tree, this being, at the point selected, 22 feet long and 33 feet in circumference.

The tree was first stripped of its bark after which it was, with considerable difficulty, hollowed out. The section, which weighed more than 40 tons, was moved into position for working by the aid of

the truck. The preparing of this log took weeks of time and after it was finished it was jacked up and the truck was run beneath it. When thoroughly dried it weighed about 5000 pounds. Later the car was fitted with windows and doors and, inside, it was equipped with beds, kitchenette, closets, electric lights, and many other features that would add to the comfort of the travellers. Both inside and out this log body has been polished and varnished in the natural wood, so that it presents a very beautiful appearance.

Mr. and Mrs. Kellogg are touring the country in this novel "limousine." When on their entertainment tours they always travel in their "Pullman," for it permits them to live close to nature and to really see the world as they are passing through it.

HOW TO FOCUS HEAD LIGHTS.

It is a simple matter, indeed, to focus the light. This can be done by standing the car on level ground in a dark place 25 feet from a wall. Remove the lenses, turn on the head lights and focus the same, covering one of the head lights with a card while the other is being focussed. If the center of the light is the same distance from the ground as is the bulb the light is in focus. With both lights free from obstructions and in proper position the center of the light from each lamp should be equal and, with the lenses attached, one should merge into the other.

The Automobile Journal, however, recommends the use of a circular card big enough to hold over each lamp with two $\frac{1}{4}$ inch holes, four inches apart, punched.

Instructions for Focussing with Card.

1—Stand the car on level ground, in a dark place, 25 feet from a wall.

2—Remove the lamp glasses, turn on the head lights and cover one lamp while focussing the other.

3—Place this card close in front of the lamp being focussed. Two V-shaped images of the filament will be thrown on the wall.

4—To make focal adjustments.

For devices which require focal adjustment: No. 1—Some means is provided in

the lamp for moving the bulb in or out. Move the bulb until the images overlap.

Focal Adjustment No. 2.

Move the bulb until the points of the V's are towards each other and four inches apart.

Focal Adjustment No. 4.

The tails of the V's are towards each other and four inches apart.

In general—When the points of the V's are towards each other the bulb filament is behind the focus, and when the tails of the V's are towards each other the filament is ahead of the focus.

A TIP TO THE TOURIST.

(Continued from Page 15.)

It is, however, fortunate that it does settle in this manner, because it is the first to escape when the drain plug is removed, thus revealing its presence. If a sample is drawn into a glass jar occasionally, water, if present, can be readily detected. Any large amount of water present with the oil may cause rusting and sticking of the pistons if the engine is left idle for a long period of time and therefore the oil should be water-free when a car, truck or tractor is laid up. A high-grade lubricant is the cheapest in the end and its use with good judgment on the part of the motorist will tend to keep the engine in fit condition.

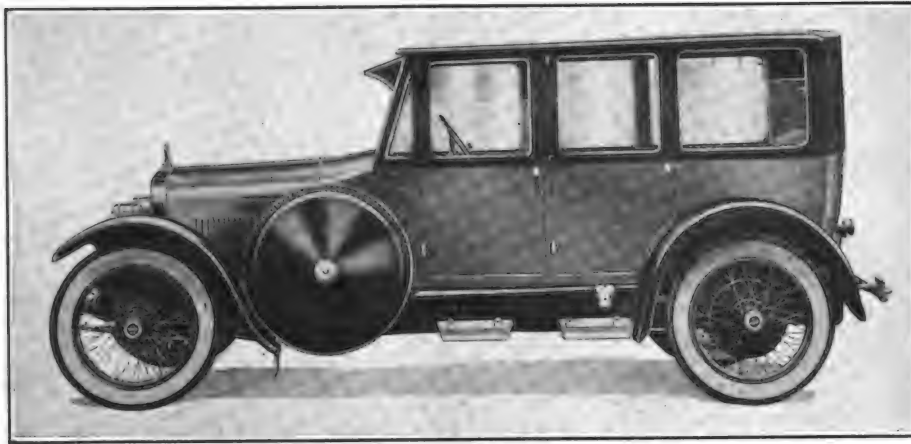
GIBSON'S NEW GLARELESS LENS.

The question of proper vehicle lighting is now being discussed all over the country and there is a considerable variation in the requirements in the different states. Florida recently enacted a law, which may be adopted by other states, that provides as follows:

"During the period from one-half hour after sunset to one-half before sunrise, there shall be displayed on the front, an illumination the full width of street or highway on both sides of the vehicle. The illumination shall be without glare covering a width of the highway necessary for the driving and approaching motorists."

The Gibson Lens Corporation, Cleveland, O., has perfected a lens which is claimed to meet the requirements of this provision. The Gibson lens is stated by the manufacturer to be the only glareless head light in the world with a full driving light. It illuminates the street or highway on both sides. There is no tilting up or down, no complicated adjustments, no dimming; just a full driving light without glare.

Full information will be given by state dealers of the Gibson Lens Corporation, or may be obtained direct from the manufacturers.



Harry C. Stutz Adds a New Model to His Line of Cars, the H. C. S. Sedan.

Sedan Model Added to H. C. S. Line

MOTORDOM had few thrills this year, so when Harry C. Stutz, designer of fine motor cars, announced that he had added a sedan model to the H. C. S. line, it took on the aspect of one of the season's sensations, for Mr. Stutz has combined the richness and beauty of a closed car for town use with the stamina which characterizes the entire H. C. S. line of touring, roadster and coupe models. To build a car having the individuality and appointments for the most discriminating motorist and yet the ability to stand constant rough work characterizes the new sedan of Mr. Stutz.

Richness and fineness mark this new sedan. The roomy, four-passenger body is made of aluminum. Hand-buffed, blue Spanish leather covers the front seat, while the rear seat is upholstered in broadcloth. Adjustable side and rear windows, fitted with curtains, add to the car's appeal. Vanity cases and a smoking set are conveniently placed, while all appointments are of silver finish. For an aid in driving a sun visor has been placed on the windshield. Wire wheels are standard equipment and two spares are included.

The new sedan is one of the few new models being brought out this year by automobile manufacturers in the United States, most of them being content to cling to their established lines during this period. Economy of operation which marks the entire H. C. S. line finds expression in the new sedan and for that reason it is making a wide appeal to automobile owners and prospective motorists.

Driggs Car Is Moderate In Price

AN INTERESTING development in automobile circles is the announcement of the Driggs Ordnance & Manufacturing Corporation, of which L. L. Driggs is president, with executive offices at 19 West 44th street, New York City, and factory at New Haven, Conn., that it will shortly start production of a new car. The name of

the new car is the Driggs and it is to be a four-cylinder, light-weight, economically operated and maintained automobile. The selling price will be \$1175 for the touring car, with \$100 additional for the special roadster or sport model. A sedan model will be added to the line in the near future.

The Driggs Ordnance & Manufacturing Corporation's organization has had many years experience not only in the manufacture of war material for this and other



New Driggs Roadster, with Its Trim Lines, Offers an Economical Business or Pleasure Car at Moderate Cost.

governments, but also in the production of automobile parts. The building of guns requires a maximum of accuracy and skill in order to insure the precision necessary. To properly perform its work for the government and to turn out ordnance of the best type, it was necessary for the company to assemble a personnel of unusual skill. This specialized organization, with its knowledge and experience in the heat treatment and use of alloy steels, is now to be employed in the production of automobiles.

European Engineering Features Incorporated.

The new Driggs, in which all of the features incorporated in the light-weight, economically-operated European cars have been attained with the addition of many improvements and refinements, has a decidedly stylish appearance. It has been designed in accordance with the

best established engineering practise. In order to obtain sufficient and reliable power on the minimum gasoline consumption, the engineers of the company have designed a special small-bore and long-stroke engine. This model, while rated at about 11 S. A. E., actually delivers 18 horsepower. The bore is 2½ inches and the stroke 4½ inches. This small-bore, long-stroke engine gives an amount of power per pound fully as great as that of the high-powered cars and naturally at a considerable reduction in the amount of gasoline consumed. Several tests made with the experimental cars convince the manufacturers that the Driggs will run under ordinary circumstances at least 30 miles to a gallon of gasoline.

To further minimize the up-keep cost of operation the company is using its knowledge of alloy steels to produce a vehicle which, when equipped, only

weighs a trifle more than 1600 pounds. Special attention has also been given to accessibility of parts most likely to require attention or replacement, with the result that the entire power plant may be easily reached for repairs or adjustment, a fact that will appeal to owners who do their own mechanical work.

In appearance the new Driggs is decidedly attractive. The three styles of bodies are mounted on the one 104-inch wheelbase chassis. The color scheme is very pleasing. The bodies are painted a beautiful celestial blue. The upholstery is a fine grade of Spanish leather; dark blue being used for the touring car and tan for the roadster. The Driggs cars are unusually well built, the sheet metal covering being made to closely conform to the lines of the wooden body and not simply hung on. The standard equipment includes wire wheels.

CARS

Pilot Follows Conservative Lines

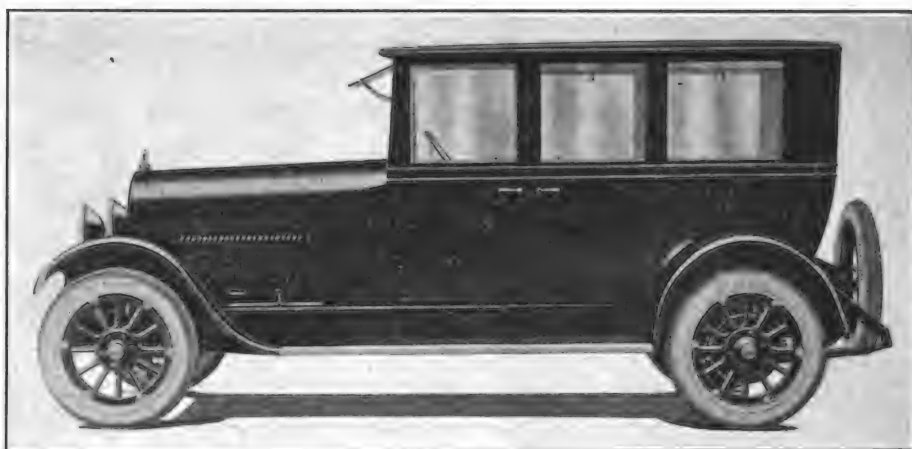
THE Pilot 6-50 is the latest product of the Pilot Motor Car Co., Richmond, Ind.

In keeping with the long-established policies of the Pilot Co. this new model has been designed along conservative lines both as to its chassis construction and body design.

The chassis includes such well-known units as the Herschell-Spillman Model No. 1100 six-cylinder, $3\frac{1}{4}$ by five-inch engine, Bijur starting and lighting system, Borg & Beck clutch and Columbia axles. Every engine used in Pilot 6-50 passenger cars is carefully block tested under a heavy load in the Pilot plant from 10 to 16 hours, after which the engine is completely torn down, the pistons, piston rings, cylinder walls, etc., are examined, the bearings taken up, valves reground by hand and any part which shows the least wear is replaced. After which the engine is rebuilt and again block tested for quietness.

Other units used are as carefully tested and examined with the result that when the car is completely assembled and has passed the road test which this company gives each car, any faults which may have developed have been discovered and corrected and the car is ready to go into instant service without further breaking in.

The Pilot Co. thoroughly believes that the average purchaser is tired of buying partially equipped cars and, for that reason, Pilot 6-50 cars are completely supplied with every convenience necessary for the motorist's comfort. Equipment includes a bumper, Motometer, gas-



Pilot 6-50 Sedan Typical of Latest Product of Pilot Motor Car Co., Richmond, Ind.

oline strainer, gas shut-off valve, eight-day keyless clock, and all other necessities which go to make complete equipment. The ventilator is of special Pilot design, is extremely simple and has only one moving part. A special reserve supply gasoline tank constructed integral with the main supply tank provides, in a simple and positive manner, a reserve supply for emergency use.

Pilot Produces Five Distinct Models.

The Pilot 6-50 is produced in five different and distinct models as follows:

Two-passenger roadster, five-passenger touring car, seven-passenger touring car, four-passenger coupe and five-passenger sedan.

The open cars are constructed along streamline designs, particular care being given as to finish and equipment. The lines are striking, though conservative, that they may be in keeping with the dictates of good taste.

Kurtz Has Patented Gear Shift

SINCE the days when the self-starter surprised the motor-loving public, it is stated no such outstanding vital improvement has taken place in the manufacture of automobiles as the intro-

duction this year of the Kurtz Automatic. This motor car, according to automotive engineers, is destined to quickly and permanently secure a wonderful position in the great field of motordom.

Not only is the Kurtz Automatic a car of beauty and refinement, manufactured by a well-financed and responsible group of men, but it eliminates the old, cumbersome gear-shifting rod and emergency brake in the floor. The gear-shifting system is the invention of C. B. Kurtz, one of the foremost automotive engineers of America and, after two years of experimenting, the system has been pronounced positive, quick, simple and a boon to those who drive motor cars.

Engineering circles have been greatly interested in this unique system and are said to have given it their enthusiastic endorsement after an examination covering a period of many months. Incidentally it may be said that this invention is not complicated in its operation.

The shifting of gears is accomplished by means of a third lever on the steering wheel sector operated in conjunction with the clutch pedal. The device is purely mechanical and is non-magnetic, non-electrical, fool-proof and absolutely reliable. Four cars have been driven a distance of 50,000 miles each, without the least trouble or slightest inconvenience to the drivers.

It is said that the Kurtz system permits of pick-up fully 25 per cent. quicker than the use of the old floor rod. Another remarkable advantage is the fact that this device eliminates the possibility of stripping gears. With the Kurtz Automatic the driver need never take his eyes off the road or his hands from the steering wheel. The emergency brake is a pull-out handle conveniently located on the instrument board directly under the steering wheel where it can be reached in an instant.

The factory of the Kurtz Motor Car Co. is located in Cleveland, O., and ever since the introduction of the car has been operating to capacity in order to supply the demand. This is taken to indicate that the motoring public has quickly appreciated the advanced principles of this car. Dealers in all parts of the country report big sales and say that customers are most enthusiastic when they find how easily and simply the Kurtz gear-shifting system operates.



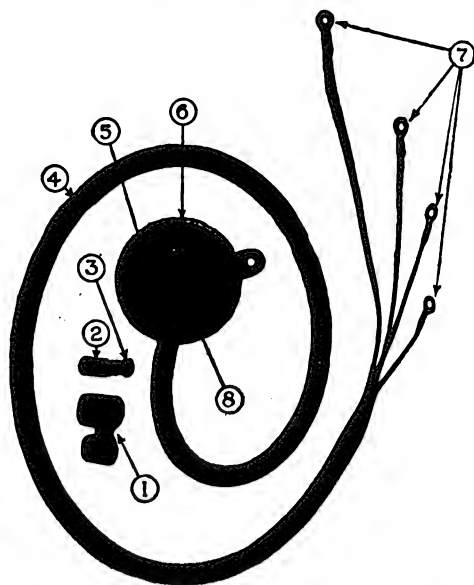
New Kurtz Passenger Car, Equipped with Patented Gear-Shifting System, Which Proves Efficient and Prevents the Possibility of Stripped Gears.

ACCESSORIES DEPARTMENT

The Turner Two-in-One Timer for Ford motors is designed to eliminate those short comings to which timers on low-priced cars and replacement units are sometimes subject. The different parts are shown by reference to the numbers in the cut.

No. 1 is the brush container, which is cast steel and brass, accurately machined. No. 2 is the contact brush of specially treated phosphor bronze, which is grooved to slide in a pin, a feature of the Turner timer, which is stated to make any variation in timing impossible. No. 3, the contact spring, is of high-grade piano wire, telescoping type. This spring maintains the tension of the contact brush against the timer face the same at all times, whether the speed is three miles an hour or 50.

No. 4 is the flexible metal conduit cord, which entirely houses all wires. This system is guaranteed short-proof, water and oil-proof. No. 5 is the genuine Bakelite insulated timing disc, guaranteed not to warp or change its shape. No. 6 is the



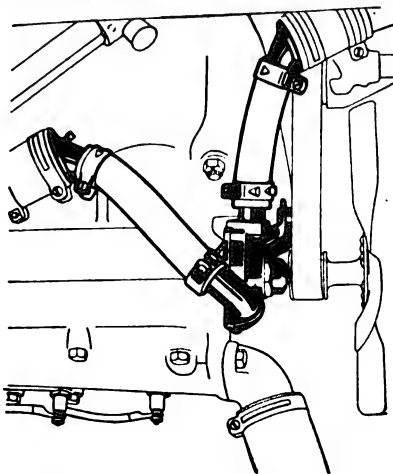
timer shell of aluminum, machined to size, with a polished finish that will resist rust and is water-tight.

At No. 7 will be noted four different lengths of wire, the only ones that have to be connected. They cannot be put on wrong as they are in four different colors. No. 8 hardened brass contacts of the best quality are used.

The Turner Timer is easily installed and is guaranteed for a period of one year against defective material and workmanship. Furthermore, if after 30 days use it is not giving satisfaction it may be returned and the purchase price will be refunded.

Manufactured by the Turner Manufacturing Co., Kokomo, Ind. Dealers are requested to write for attractive proposition.

The Ospeco Centrifugal Water Pump for Ford cars is designed with the object of eliminating over-heating in summer and "freezing below and boiling on top" in winter, and to replace uncertain thermosyphon circulation by positive forced circulation. The Ospeco pump forces the water through the radiator and around the engine constantly at an even temper-



ature, the rate of flow depending on the speed at which the motor is operating. Its design and construction are similar to the water pumps used on cars which are factory equipped in this way.

It will thus give to the Ford owner, at small expense, the same kind of motor cooling system as is found on cars costing many times as much. It attaches to the fan bracket and is driven by the fan belt. The regular fan and fan belt pulley are mounted on the pump shaft, thereby eliminating the use of an additional belt to drive the pump.

Its installation is a short, easy job and requires no skill. The standard fan bracket is simply loosened and removed and the belt slipped off. The fan is removed from the fan bracket, slipped on the shaft of the Ospeco pump, tightened up and the whole assembly substituted for the original fan bracket. Then the pipe connection between the bottom of the radiator and the left side of the engine is removed and the water connections to and from the Ospeco pump are placed in position and fastened.

It is stated that there is absolutely nothing about the Ospeco Centrifugal water pump to wear out or get out of order. In fact there are only two moving parts, the shaft and water circulator, which operate as a unit.

Made and guaranteed by the Michigan Products Co., Detroit, Mich. Sold by the Crawford-Lewis Corporation, Detroit, Mich. List price, complete, ready to install, \$15. An attractive proposition is open to dealers.

The Hyrate Battery Analyzer is designed in accordance with the Hyrate discharge method of testing automobile bat-

teries, and preserves the excellent feature of making a high-rate discharge through patented chromel resistance and combines with it the unique arrangement of a third terminal voltmeter of an easy reading type. Attached to the third terminal of the meter, by means of a flexible lead, is a fork spike, as shown in cut. One spike of the fork is the test point for voltage test and the other spike is the cadmium electrode for making cadmium test.

It is fairly well established that the cadmium test and the open circuit voltage tests are desirable in determining the condition of either group of plates within the cell without actually dismantling or opening the battery.

The Hyrate battery analyzer is a complete battery testing outfit, capable of making three different kinds of tests of storage batteries, as follows: High-rate discharge test, plain voltage test and cadmium test.

In addition to the original two terminals of this instrument, a third terminal has been added, from which a calibrated resistance leads to the moving coil of the instrument itself. To this third terminal is attached a flexible lead as described above. The addition of the third terminal and lead (which is removable as a mat-



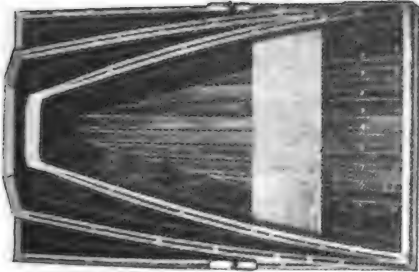
ter of convenience) in no way interferes with the use of the instrument as a Hyrate cell tester. However, when it is desired to take open circuit voltage readings or cadmium readings, either one of the prods of the tester is applied to the positive terminal of the battery and the lead connecting the third terminal of the instrument is applied either to the other terminal for open circuit reading or the cadmium spike electrode is immersed in the electrolyte to give the positive cadmium readings. For the negative cadmium reading the prods are merely shifted to the negative terminal.

It is readily seen that the Hyrate battery analyzer can be used to make the two generally accepted essential tests for determining the condition of a battery, and in addition thereto can be universally used for more voltmeter work on storage battery cells, giving the instrument a very wide range of action.

Manufactured by the Service Station Supply Co., 30-32 East Larned Street, Detroit, Mich.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

Darrow's Sectional Boat. The illustration shows a Darrow sectional boat which should make an especial appeal to autoists who require a boat on their outings or vacation tours. This is stated to be one of the most versatile and practical portable boats on the market. It will ride on the running board or in the tonneau of any automobile. It is light, durable and safe, is built of the best grade of galvanized steel and reinforced with clear oak or cypress. It is of the float bottom, flaring side style and is stated to be very steady in the water.



Each section is a complete boat in itself and the sections nest together when the boat is being transported. A 12-foot boat thus nests in a space 50 inches long and 40 inches wide. The sections may be joined in five minutes without the aid of special tools. The catalogue number of this outfit is Model O, and it may be obtained in six different sizes, as well in a special 14-foot size for outboard motor use.

Manufactured by the Darrow Steel Boat Co., Albion, Mich. Description and prices on request.

The Schrader Universal Tire Valve, Spare Parts and Accessory Kit is designed especially for the convenience of motorists on tours who desire to have tire repair and supply equipment in convenient and compact form. The Schrader Kit contains every accessory that has to do with a tire valve. In addition to a box of Valve-Insides, there is included a set of Schrader Kwik-On-An-Off dust caps, a set of rim nut bushings, five valve caps, a valve re-



pair tool, a pump connection which permits testing of the tire inflation without disconnecting the pump from the tire, a wrench for the tightening of the hexagon nuts at the base of the valve stem and a Schrader Universal tire pressure gauge.

This kit is packed in an attractive leather-covered case and makes a very acceptable gift for presentation to any motorist.

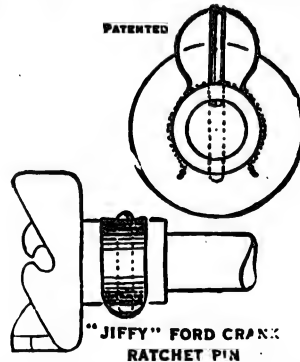
Manufactured by A. Schrader's Son, Brooklyn, N. Y. Retail List Price, \$5.

The Jiffy Ford Crank Ratchet Pin is a device patented and placed on the market for the purpose of securing the crank ratchet pin on a Ford car against displacement and providing a quick and substantial means of replacing a lost or worn crank ratchet pin momentarily at a small cost without the necessity of skilled labor

and the removal of the car to a Ford service station.

Experience has proven that the crank ratchet pin securing the crank ratchet of a Ford automobile to the crank of the car often becomes displaced and necessitates the insertion of a new pin which under present methods requires riveting to guard against displacement. The position of the pin is such as to require either the removal of the radiator for this process or the employment of two men and special implements to burr a head on each end of the pin to hold the pin securely. In the course of time the pin becomes worn and drops out requiring a similar operation.

The Jiffy Ford crank ratchet pin eliminates all labor and is quickly and expeditiously inserted and cannot work loose or drop out. Its employment elim-



inates all inconvenience and cost incident to the replacement of the present type pin; permits the removal of the crank ratchet at any time for the purpose of putting on a new fan belt if necessary or replacing the crank ratchet, or crank shaft pulley without the removal of the radiator.

Distributed by the Rosier-Howard Corporation, Hutchinson, Kan.

The Red Star Timer for Ford cars, trucks and tractors is stated to be made as a timer should be made; from the shell, which is stamped steel, copper coated and nickel-plated, right through to the spring of the oiler, the best material goes into it. The fiber race is of real fiber, not compressed card board. The fiber is cured, treated and processed specially for this use. It is the natural color and no mineral dyes, which might cause short circuits, are used to camouflage it. It is made to resist oil and water, heat and cold, wear and tear, and has a minimum of expansion and contraction. It will not corrugate and get bumpy; it cannot wear off in layers—fragments cannot be brushed away by the action of a poor roller; oil cannot get into or around it to cause



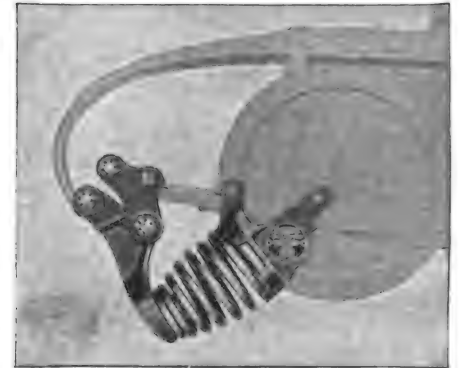
shorts. The contact shoes cannot wear out of place. Every shell is gauged so that it will positively fit the Ford motor; the individual inspection of every timer guarantees that. Every terminal is thoroughly insulated.

Another point that makes the long life of the Red Star possible is that it consists of a roller on a roller; a roller that rolls under all conditions. The axis or pin

of this roller is of soft steel to facilitate rivetting. On this axis is fitted a case-hardened steel sleeve upon which a case-hardened steel roller rolls. This combination is virtually a roller bearing.

Made by Auto Components, Inc., 1603 South Michigan Boulevard, Chicago, Ill. Sold only in the box with the Red Star trade mark.

A Hassler Shock Absorber for the Dodge Brothers car is announced. Exhaustive road tests have been going on for the past



two years on this new product and it is reported to be in keeping with the excellent reputation now enjoyed by Hasslers in use.

This new product, although built on the same principles as the standard model, is made to conform to the general requirements of the Dodge Brothers car. It does not detract from the good appearance; in fact, it is stated to add smartness and a finished touch that is desired by car owners. It does not require the changing of a single part of the car, either the spring or axle construction.

Further, this new Hassler will afford the same advantages which have made the name Hassler so prominent in the motor car accessory field: True comfort and a big saving in tires, upkeep and depreciation cost. A million sets of Hassler shock absorbers already in use prove that motor car owners believe these advantages very much worth while.

Manufactured by Robert H. Hassler, Inc., Indianapolis, Ind.

The Benson Universal Battery Connector will connect the rental battery to any car, regardless of the kind of cable terminals with which the car may be equipped. It is made of a high grade of bronze metal and is coated with lead. It will permit of service that it is impos-



ble to give under the old system and is guaranteed not to break in service.

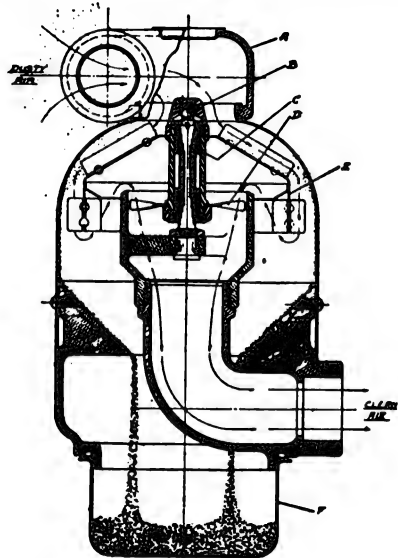
The Benson Universal battery connector is made in three sizes: No. 1-P fits the positive taper post; No. 1-N fits the negative taper post; No. 1-S fits either positive or negative straight post.

Distributed by the Rosier-Howard Corporation, Hutchinson, Kan. Prices on request.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

The Centrifugal-Type Air Cleaner is automatic in action except for the dumping of the dust receptacle.

The air enters at the top, passes over a rotor turning from 6000 to 7000 revolutions a minute and continues, as shown



in the diagram. A centrifugal action is given the air by the fins and the line of the rotor, which throws the dust to the wall of the cleaner, around which it whirls to a deposit duct at the bottom.

It is of course necessary to readjust the carburetor after attaching the cleaner and test charts of engine markers show no loss of power where the United cleaner is in use.

Manufactured by the United Manufacturing & Distributing Co., Lake Shore Drive, Chicago, Ill.

The Sprague One-Ton Electric Hoist is now being supplied service stations and repair and machine shops mounted on a monorail, which particularly adapts it for heavy work.



The casing of the hoist is composed of two circular iron castings bolted together with sufficient space between to contain the motor, controller and drum, which are enclosed by sheet iron covers. This frame is provided with suspension lugs for the support of the hoist. All bearings are roller type, packed in grease, requiring lubrication only at intervals of several months.

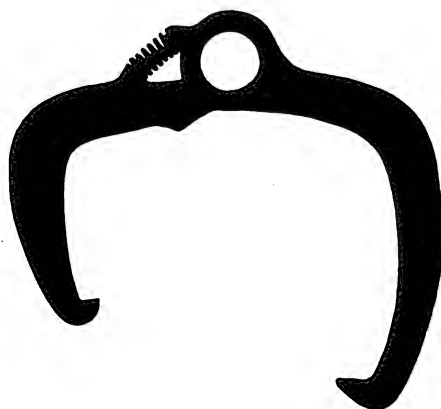
Manufactured by the Sprague Electric Works of the General Electric Co., 527-531 West 34th Street, New York City.

The Apex Engine Tongs will fit on the Ford, Overland "4," Chevrolet and Maxwell engines, and is a time-saver both for lifting the engines out of the chassis and for hoisting the whole power plant, the engine only, or the cylinder block (except on the Chevrolet, which is grappled by the head), while the engine is being handled about the shop in the process of repair.

It is impossible for the hold of the tongs to loosen while the weight of the engine is on them as the pull of the load draws the points closer together and they hook securely into ports or into the depression under the water jacket between two cylinders.

Both the Ford and Overland engines are handled by the Apex Engine Tongs equally well with or without the cylinder head in place.

On the Chevrolet engine the long arm of the Apex tongs hooks into the rear inlet port, the short arm hooking under the ledge at the top of the opposite side of the cylinder head.



The Apex Engine Tongs are provided with a spring that holds them in place on the engine so there is no danger of their falling or getting out of place before the hoist is pulled up. They are both safer and quicker than a rope sling and are more useful than an engine lathe in an ordinary automobile repair shop. The material is malleable iron of the same quality as many of the important structural parts of the cars themselves.

Manufactured by the Apex Manufacturing Co., P. O. Box 43, Elizabeth, N. J.

A New Heavy-Duty Johnson Electric Buffer was recently developed, having an overall shaft extension of approximately six feet so that two men can work on the same machine at one time without interfering. This buffer is built in a number of different sizes for two or three-phase alternating current, the five horsepower, 3600 revolutions per minute being the most popular size.



Large deep grooved standard ball bearings are used on these machines, one set of bearings being at the end of the housings with another at the center of the machine to prevent periodical vibrations of the rotor.

Although in collaboration with the engineers of the Goodyear Tire & Rubber Co. in designing this machine as a buffer for pneumatic truck tires, the machine has proven ideal for many purposes such as use in plating plants, radiator works, sheet metal works; in fact, it is adaptable for use wherever a heavy duty buffer is required.

Manufactured by the United States Electrical Manufacturing Co., Third and Central Avenue, Los Angeles, Cal. A special proposition is open to distributors.

The Buss Auto Fuse Assortment Case presents a logical way for dealers to buy automobile fuses because the cost per fuse is less, a convenient and attractive case for stock is provided, the case has the latest complete list of cars on the



cover. It carries illustrations of all types of fuses on the market and contains a card giving list prices on all types.

The fuses are packed in standardized cartons, 10 to a carton. Car owners will invariably buy a full carton.

The accompanying illustrations show the three principal types of Buss fuses, the glass tube at the top, the link type in the center and fiber tube at bottom.

These goods are approved by the Underwriters' Laboratories in all sizes recommended by the Society of Automotive Engineers.

Manufactured by the Bussman Manufacturing Co., St. Louis, Mo. Catalogue, circulars, etc., on request.

Fyno Cream Soap is stated to be a boon to the motorist in that it instantly removes road tar, grease and grime from the hands. It is especially valuable



where water is not available because, with Fyno, no water is required. All that is necessary to be done is to rub a small quantity well into the hands and it is said to be surprising how rapidly it will loosen every particle of dirt, black grease and grime—then the hands are wiped off with a cloth or piece of waste and the dirt has disappeared.

Fyno has the same soothing, cleansing and healing effect as cold cream. It contains absolutely no acid, caustic alkali, grease or grit. It also removes fruit, vegetable and other stains that ordinary soap has no effect upon—cleans porcelain, glass, marble, woodwork and other dull and polished surfaces, and makes rugs and carpets look like new.

Manufactured by E. Fongera & Co., Inc., 90-92 Beekman Street, New York City. Retail price, 25 cents a can.

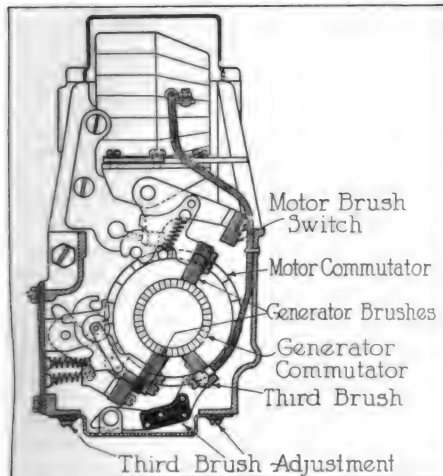
(When Writing to Advertisers, Please Mention the Automobile Journal.)

Engine Operation During Touring Season

ATTENTION TO DETAILS MAKES TRIP A PLEASURE LONG TO BE REMEMBERED—STORAGE BATTERY MORE SUSCEPTIBLE TO OVERCHARGING AND HEATING DURING WARM WEATHER.

DURING the months of August and September the motorist will find that the working units of his car require more frequent attention than during the colder winter months. The reason for this state of affairs is obvious to the experienced motorist.

The extra attention required by the batteries during the summer is not entirely due to evaporation from heat, but is accounted for in part by the fact that the



Moving Third Brush in Direction of Rotation Increases Current Output and in the Opposite Direction Decreases Output.

engine starts more easily and, therefore, less current is used. Also, there is more daylight riding, especially in the localities where daylight saving laws are in vogue, and the lamps are, therefore, used considerably less. So the battery is more often in a fully charged condition, and the charging current causes more gas than when the battery is low. This condition is due to the chemical action which decomposes the water, the hydrogen and oxygen gases passing off through the vent holes in the top of the battery, and not as vapor. Careful attention should be given the battery at this period to keep the cells filled to the top of the plates with distilled water, and the vent plugs should be removed at least every 10 days and in very hot weather once a week, and the height of the water examined. Overcharging and gassing of the battery during this period causes sulphation to set in, which coats the battery terminals with sulphate of copper, preventing the current from passing and causing the starting motor to fail to turn over the engine or the lights and horn to function properly. If this condition exists, loosen and remove the terminal wires from the battery, with a piece of sand paper smooth off the corrosion till the bright metal of the terminal appears; do the same with the terminal socket on the battery, using a jack knife or scraper for the purpose, coat the socket and terminal with vaseline and remake the connection

tight. The vaseline will prevent further sulphation for a time at least.

Generator Regulation.

There are different methods in vogue for regulating the output of the generator. At present the third-brush system is much in use and as it is the simplest to control its method of regulation will be described.

The long days of summer and the adoption of daylight saving in many localities gives the business man who drives his car throughout the day a longer period in which to charge the storage battery. The short period in the evening when the lights are used does not draw heavily enough on the battery to use up this excess current so the battery is operating in a fully charged condition practically all of the time. Again the effort required to start the engine does not use as much current from the battery in summer as in winter. As these two sources are practically all of the current stored in the battery, the short periods they are used are not sufficient to keep the battery charged properly.

To remedy this trouble in a car equipped with a generator with third-brush regulation, it is necessary to change the position of the brush either forward or back till the desired output, as shown by the ammeter, is obtained.

The third-brush principle of regulation depends entirely for its operation upon the reactions which exist in the armature when it is rotated and generates a current. In most generators employing this principle, moving the third brush in the direction of rotation increases the charging rate, and in the opposite direction decreases the rate. Bearing this fact in mind the owner or repairer who is adjusting the brush should, after removing the cover over the brush holders, note the position of the third brush and its

method of fastening. This will vary with different makes, but will usually be found to consist of an adjustable bracket supporting the brush between the two main brushes. Screws are used to tighten the adjustment after the generator output has reached the desired number of amperes on the charge side of the ammeter. After the brush has been set and the adjustment tightened, the brush should be seated with sand paper, the sand paper side towards the brush. To do this properly, cut a strip of paper the width of the commutator and pass it over the commutator, sand side up, allowing the third brush to rest lightly upon the sanded surface. Pull the strip of paper back and forth till the face of the brush conforms to the shape of the commutator. This will allow the brush to carry its full load and prevent arcing.

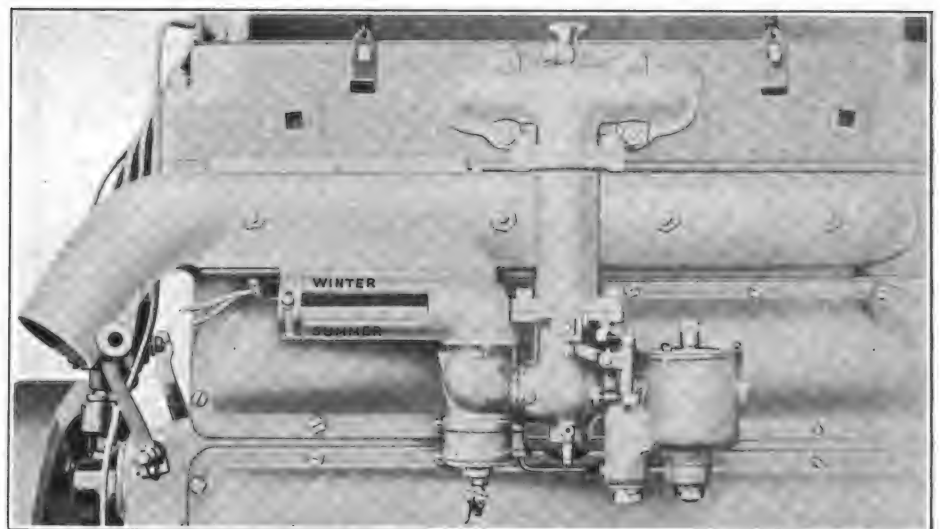
When the generator leaves the factory it is adjusted to meet the requirements of ordinary driving and should not need further adjustment unless under extreme driving conditions.

Adjusting Carburetor.

It will be found that the car will run equally as well if the gasoline needle valve is adjusted towards lean, the saving in fuel will increase and the additional mileage of a gallon of gasoline will mean quite a saving during the summer months.

Operating on a lean mixture will be found to give an increase in the power of the engine, preventing overheating of the cooling system, the formation of carbon in the combustion chambers and causing the engine to operate smoothly on the level and on hills. This is easily accomplished by the dash adjustment, turning the lever to lean after the engine has started, or by changing the needle valve on the carburetor.

In many cases it will be found advant-



Opening This Slide During Summer Allows Cold Air to Enter Air Stream, Preventing Overheating of Mixture and Engine—Close for Winter Driving.

ageous to dispense with the use of the hot air stove on the exhaust pipe which supplies the air to the carburetor air intake. This additional heater is needed in winter, but in summer on some cars the engine will run better without it.

Many cars have a fitting attached to the carburetor, which consists of a collar, with a slot at one side corresponding with a slot in the flexible metal tube connecting the stove with the carburetor intake. Turning this collar till the slots register, and tightening, admits sufficient air to offset the heated air taken in from the stove, allowing the engine to operate with the stove in position on the pipe.

When touring in hilly countries, where the air is colder, it will be found that the engine will require a richer mixture, this is easily furnished by opening the needle valve by means of the dash adjustment or by turning the needle valve of the carburetor slightly open.

Cooling System Troubles.

Troubles of the cooling system during hot weather can usually be laid to two causes, or in extreme cases to three. The first cause and one that gives the most trouble is the restricted flow of the cooling water. This may be caused, as mentioned above, by one of several causes, restricted rubber hose, non-freezing encrustations in the water jackets and radiator tubes, tubes which have been cut out of the radiator during repairs; second, too rich a mixture from the carburetor and, third, by operating the engine with retarded spark.

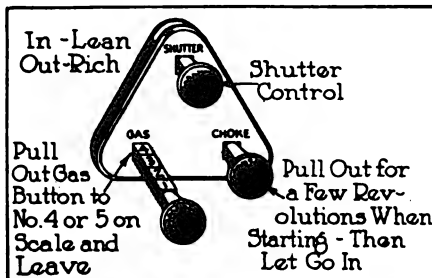
Low water in the radiator also causes overheating; see that the water is kept at correct height.

Restricted rubber hose is easily located by pinching the hose between the thumb and fingers, the softness of the hose determining its condition. Good hose should offer resistance to pinching, while softened hose will pinch together easily. Remove the softened hose and replace with new, for if it is not causing the trouble at present, it is only a matter of a short time before it will. Removing it at this time will assure the motorist that there should not be trouble from this source for several months.

Non-freezing solutions often are made up of calcium or some other powder

which will leave a white deposit in the water jackets and other units of the cooling system. These deposits increase and eventually partially stop the circulation. They may be removed by washing out the system thoroughly with sal soda dissolved in hot water and placed in the system after it has been drained. Run the car for a half day with this solution in the system, drain it out and flush several times with cold water, refilling with fresh water.

If the engine still overheats after several days use, repeat the foregoing process and nearly all of the incrustation and sediment should be removed.



Essex Choker and Shutter—Obey Instructions Implicitly and Do Not Drive with Choker Pulled Out as Overheating of Engine Will Result.

Radiator repairs during the year, in which the repairer has found it necessary to close one or more of the sections, will often cause overheating, especially in an old car. The owner of such a car usually knows that the condition is present and handles his car accordingly. About the only cure for this condition is to replace the radiator core with a new one of the same capacity or larger.

A rich mixture will often cause the engine to overheat, especially in summer, as the gas which enters the combustion chambers of the engine causes a higher heat when it is exploded than does a lean or correct mixture. When we stop and consider the fact that the temperature in the combustion chambers at the time of explosion is between 2000 to 3000 degrees Fahrenheit and that the heat of the piston heads is between 300 and 1000 degrees, it is no wonder that a slight increase in mixture will raise the heat unnecessarily. Careful attention to this detail will prevent the cooling system from

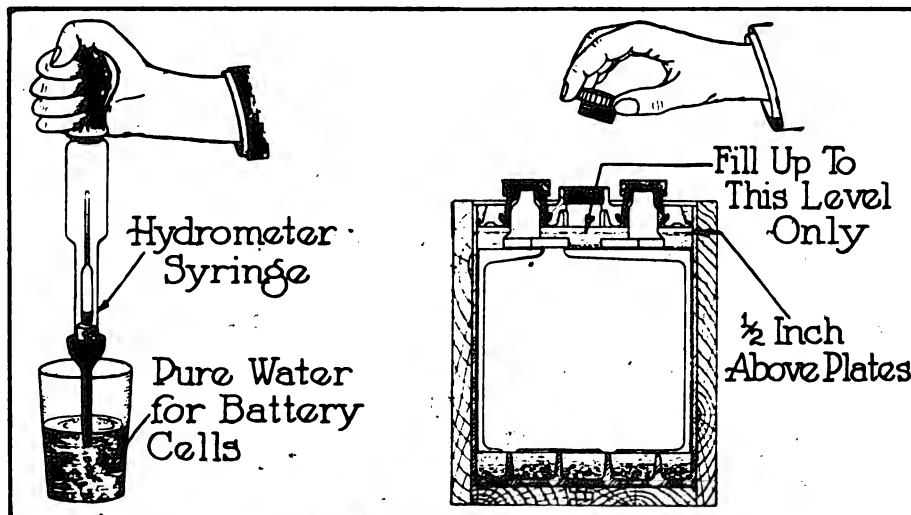
overheating during hot weather, helping the engine to develop its rated power.

A common cause of overheating and one which motorists often neglect is that of driving with the spark lever in a more or less retarded position. The writer had a case of this kind called to his attention recently. The owner of the car could not understand why his car continually overheated. He had placed a new timer on the engine, the carbon had been removed from the engine and the carburetor seemed to be set correctly.

After studying the car and checking over possible troubles systematically, it was decided to clean out the radiator with sal soda and hot water as a non-freeze solution had been used the previous winter. This did not remedy the trouble, so the writer drove the car for a few minutes with the owner. The spark was advanced to its proper position and the engine ran perfectly, with the exception of a slight knock in the No. 1 cylinder, caused by either a loose wrist pin or a piston slap. As soon as the spark was advanced the owner objected, stating that he never ran with the spark that high, as it caused the knock to sound more plainly.

Telling him to not mind the knock, but to carry the spark high, he started off promising to do so. Several days later the driver informed the writer that his engine had not overheated in the mean time, proving beyond a question of a doubt that his trouble was caused by driving with a retarded spark. After 1000 miles or more a driver can easily tell the difference between a knock caused by the engine laboring and one occasioned by wear of the engine parts.

To show further at what temperatures the different units of the engine operate, it must be remembered that the oil in the crank case, when the engine is working, will show a temperature varying between 90 and 200 degrees Fahrenheit; that the crank shaft oil is working at a temperature of 140 to 250 degrees and that the oil on the interior of the cylinder walls show a temperature from 180 to 350 degrees Fahrenheit. Bearing this in mind, the summer driving motorist and especially those who drive constantly or take long trips, should see that they are using the proper grade of oil and change the oil often enough to remove the minute pieces of metal that wear off from the bearings, becoming deposited in the reservoir oil. This is even of more importance in full pressure feed lubricating systems where the oil is forced through drilled passages in the crank shaft to the bearings of the engine. To be sure, this oil is screened as it goes from the engine reservoir to the pump, but this does not prevent the passage of minute particles of metal—which at the temperature which must exist in the system during summer—from doing harm to the bearings. On the other hand, the oil must be of such a body and grade that it will successfully stand up under this temperature and lubricate the bearings and reciprocating parts of the engine so that the engine as a whole may function properly. Attention to this summer detail tends to make the use of a motor car a joy and pleasure to the owner.



Method of Supplying Storage Battery with Distilled Water Showing Level to Which Water Should Be Filled.

A Word of Explanation.

IN PREPARING the various maps and itineraries for this issue of the **AUTOMOBILE JOURNAL TOURING NUMBER**, the purpose has been to make them as largely self-explanatory as possible. In order that the tourist may, however, be able to utilize them to the best possible advantage, some explanation, particularly of the large chart on Pages 32-33, may be of service.

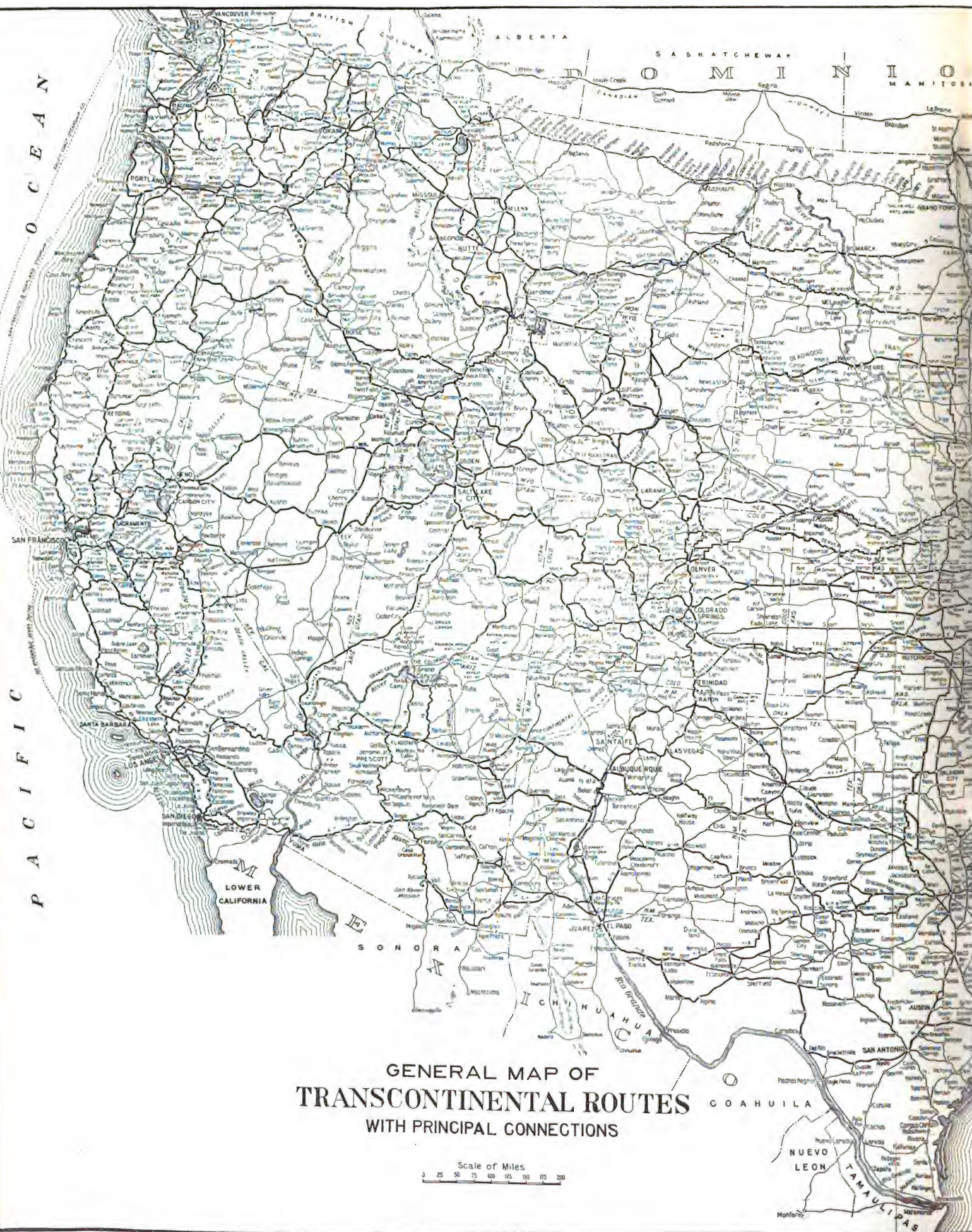
It will be noted that this large double-page map outlines 18 of the principal completed and projected main national highways of the country, covering practically every section. These various routes are keyed by number, and any tourist desiring to proceed from his city to any other point can select the route best suited to his needs and can readily trace it on the general map.

As the extent of territory covered by this general map necessitated a considerable reduction, the names of cities and towns, as well as the numbers of the routes, appear in rather small type in some instances, and the use of an ordinary reading glass is recommended as an aid in planning out routes from this chart.

After selecting the general route and tracing it on the general map, the tourist will find his itinerary shown more in detail in the sections covered by state, sectional and city maps. The smaller charts and city maps are, it will be seen, practically self-explanatory, as the roads to the principal adjacent cities are plainly marked so that the tourist coming in from any one of them will be able to utilize the more detailed maps when reaching the border.

The General Index of tours, Pages 34-39, includes the principal places mentioned in the various itineraries, the folios referring to the pages on which they may be found. Cities, states and sections having special maps are so denoted in the General Index.







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THE TRANSCONTINENTAL ROUTES

ITINERARY.

The Lincoln Highway.

Night Stops—Philadelphia, Gettysburg, Bedford, Pittsburgh, Pa.; Canton, Lima, O.; South Bend, Ind.; Chicago, Ill.; Clinton, Marshalltown, Ia.; Omaha, Kearney, Neb.; Julesburg, Denver, Col.; Cheyenne, Rawlins, Green River, Wyo.; Salt Lake City, Kearney's Ranch, Utah; Ely, Austin, Reno, Nev.; Sacramento, San Francisco, Cal.

NEW YORK-PHILADELPHIA.

| Miles | Miles |
|-------------------------|-------------------------|
| New York..... 0.0 | Franklin Park..... 41.5 |
| Weehawken..... 3.7 | Kingston..... 48.3 |
| (via ferry)..... 3.7 | Princeton..... 51.5 |
| Jersey City..... 8.0 | Lawrenceville..... 58.4 |
| Newark..... 12.2 | Trenton..... 62.5 |
| Elizabeth..... 17.1 | Oxford Valley..... 68.7 |
| Hahway..... 23.0 | Glen Lake..... 70.8 |
| Iselin..... 27.0 | Langhorne..... 71.8 |
| Menlo Park..... 28.0 | La Trippe..... 76.6 |
| Metuchen..... 29.8 | Busleton..... 81.7 |
| New Brunswick..... 35.1 | Philadelphia..... 93.6 |
| Highland Park..... 36.4 | |

PHILADELPHIA-PITTSBURGH.

| Miles | Miles |
|---------------------------|----------------------------|
| Philadelphia..... 0.0 | W. Fayetteville..... 137.4 |
| Overbrook..... 6.4 | Chambersburg..... 141.1 |
| Ardmore..... 8.4 | St. Thomas..... 148.5 |
| Bryn Mawr..... 9.7 | Fort Loudon..... 154.5 |
| Wayne..... 14.1 | McConnell's b'g..... 162.6 |
| Berwyn..... 17.1 | Harrisville..... 169.0 |
| Paoli..... 20.4 | Breeswood..... 180.5 |
| Whiteford..... 29.4 | Everett..... 188.9 |
| Dowington..... 32.5 | Mt. Dallas..... 190.0 |
| Thorndale Sta'n..... 34.6 | Bedford..... 197.8 |
| Contesville..... 38.8 | Wolfburg..... 200.5 |
| Sadsburyville..... 42.8 | Schellsburg..... 207.1 |
| Mt. Vernon..... 47.0 | Buckstown..... 218.8 |
| Gap..... 49.5 | Kanter P. O..... 222.8 |
| Kinzers..... 51.8 | Stoyestown..... 223.8 |
| Leaman Place..... 55.2 | Farrilton..... 229.8 |
| Paradise..... 56.7 | Jenners..... 230.3 |
| Souderburg..... 60.7 | Jennertown..... 231.3 |
| Lancaster..... 65.0 | Laughlinton..... 239.8 |
| Mountville..... 71.4 | Ligonier..... 243.1 |
| Columbia..... 75.1 | Youngstown..... 251.7 |
| Wrightville..... 76.9 | Greensburg..... 261.6 |
| York..... 88.0 | Grapeville..... 265.7 |
| Abbottstown..... 102.9 | Adamsburg..... 268.4 |
| New Oxford..... 116.6 | Irwin..... 271.2 |
| Seven Stars..... 120.5 | Jacksonville..... 272.5 |
| McKnight's n..... 122.4 | E. McKeesport..... 278.7 |
| Cashtown..... 124.3 | Turtle Creek..... 281.0 |
| Craftsburg..... 129.2 | E. Pittsburgh..... 282.1 |
| Calendonia Pk..... 131.2 | Wilkinsburg..... 284.9 |
| Fayetteville..... 135.6 | Pittsburgh..... 292.2 |

PITTSBURGH-FORT WAYNE.

| Miles | Miles |
|-------------------------|---------------------------|
| Pittsburgh..... 0.0 | Massillon..... 109.5 |
| Bellevue..... 5.8 | W. Brookfield..... 111.6 |
| Avalon..... 6.6 | E. Greenville..... 113.9 |
| Glenfield..... 10.4 | Dalton..... 118.6 |
| Sewickley..... 17.2 | East Union..... 124.8 |
| Fairoaks..... 18.5 | Wooster..... 130.8 |
| Ambridge..... 21.0 | Jefferson..... 134.8 |
| Economy..... 21.8 | New Pittsburgh..... 140.2 |
| Biden..... 25.0 | Rowsbury..... 143.5 |
| Conway..... 26.4 | Ashland..... 150.7 |
| Freedom..... 28.2 | Mansfield..... 164.2 |
| Rochester..... 30.1 | Ontario..... 171.0 |
| Bridgewater..... 30.8 | Gallion..... 179.2 |
| Reaver..... 31.4 | Bucyrus..... 193.0 |
| Eather..... 41.7 | Nevada..... 201.0 |
| Ohioville..... 43.0 | Up. Sandusky..... 209.0 |
| Smith's Ferry..... 46.0 | Forest..... 222.2 |
| E. Liverpool..... 50.6 | Dunkirk..... 230.1 |
| Lisbon..... 66.4 | Dola..... 233.9 |
| Hanoverton..... 75.9 | Adu..... 240.8 |
| Kensington..... 77.9 | Lima..... 258.5 |
| E. Rochester..... 81.7 | Gomer..... 269.1 |
| Minerva..... 85.7 | Delphos..... 276.4 |

| | |
|------------------------|-----------------------|
| Robertsville..... 91.5 | Van Wert..... 289.2 |
| Urbansburg..... 97.0 | Fort Wayne..... 321.9 |
| Canton..... 101.8 | |

FORT WAYNE-CLINTON.

| Miles | Miles |
|-------------------------|---------------------------|
| Fort Wayne..... 0.0 | Chic. Heights..... 154.9 |
| Churubusco..... 13.6 | New Lenox..... 172.0 |
| Merriam..... 22.6 | Joliet..... 178.1 |
| Wolf Lake..... 25.6 | Plainfield..... 187.7 |
| Kimmell..... 30.4 | Aurora..... 200.7 |
| Ligonier..... 36.4 | Moosheart..... 205.6 |
| Benton..... 46.7 | Batavia..... 209.6 |
| Goshen..... 53.8 | Geneva..... 212.6 |
| Elkhart..... 62.0 | De Kalb..... 234.9 |
| Osceola..... 68.0 | Malta..... 239.3 |
| Mishawaka..... 72.1 | Creston..... 245.6 |
| South Bend..... 76.1 | Rochelle..... 251.7 |
| New Carlisle..... 91.7 | Ashton..... 263.1 |
| La Porte..... 103.7 | Franklin Grove..... 267.7 |
| Westville..... 115.5 | Dixon..... 277.0 |
| Valparaiso..... 126.5 | Sterling..... 290.2 |
| Deep River..... 134.5 | Morrison..... 304.0 |
| Merrillville..... 141.5 | Fulton..... 316.4 |
| Schererville..... 147.3 | Clinton..... 319.7 |
| Dyer..... 150.3 | |

CLINTON-OMAHA.

| Miles | Miles |
|-------------------------|---------------------------|
| Clinton..... 0.0 | Ames..... 197.6 |
| DeWitt..... 19.5 | Ontario..... 199.3 |
| Grand Mount..... 25.0 | Jordan..... 207.9 |
| Canamas..... 31.0 | Boone..... 213.7 |
| Whentland..... 35.2 | Ogden..... 223.3 |
| Lowden..... 41.2 | Grand Junction..... 235.3 |
| Clarence..... 49.7 | Jefferson..... 243.6 |
| Stanwood..... 54.4 | Seranton..... 253.6 |
| Mechanicville..... 60.0 | Glidden..... 265.1 |
| Lisbon..... 66.9 | Carroll..... 284.1 |
| Mt. Vernon..... 68.6 | West Side..... 296.4 |
| Marion..... 81.5 | Vall..... 302.2 |
| Cedar Rapids..... 86.7 | Dennison..... 311.2 |
| Belle Plaine..... 122.2 | Arion..... 319.1 |
| Chelaca..... 129.0 | Dow City..... 321.8 |
| Gladstone..... 135.8 | Dunlap..... 329.9 |
| Tama..... 140.0 | Woodbine..... 341.4 |
| Montour..... 148.3 | Logan..... 352.0 |
| Le Grand..... 152.5 | Missouri Val..... 360.7 |
| Marshalltown..... 162.2 | Loveland..... 365.0 |
| InMolle..... 169.0 | Honey Creek..... 369.8 |
| State Centre..... 176.3 | Crescent..... 375.6 |
| Colo..... 183.7 | Council Bluffs..... 383.1 |
| Nevada..... 190.7 | Omaha..... 387.7 |

OMAHA-CHEYENNE.

| Miles | Miles |
|-------------------------|-------------------------|
| Omaha..... 0.0 | Gothenburg..... 259.3 |
| Elkhorn..... 16.2 | Grady..... 272.4 |
| Waterloo..... 19.5 | Maxwell..... 281.3 |
| Valley..... 23.0 | North Platte..... 298.9 |
| Freemont..... 34.9 | Hersey..... 307.0 |
| Ames..... 42.8 | Sutherland..... 314.4 |
| North Bend..... 50.9 | Paxton..... 327.4 |
| Rogers..... 58.1 | Roscoe..... 339.7 |
| Schuyler..... 66.5 | Ogallala..... 347.1 |
| Richland P. O..... 74.9 | Brule..... 357.5 |
| Columbus..... 83.1 | Megenth..... 362.2 |
| Duncan..... 92.3 | Big Springs..... 368.0 |
| Silver Creek..... 102.5 | Chappell..... 398.8 |
| Clarks..... 113.6 | Lodge Pole..... 399.1 |
| Central City..... 124.5 | Sunol..... 405.9 |
| Chapman..... 134.7 | Sidney..... 417.1 |
| Grand Island..... 147.5 | Brownson..... 426.2 |
| Alda..... 155.3 | Potter..... 435.6 |
| Wood River..... 164.8 | Dix Station..... 444.6 |
| Shelton..... 174.0 | Kimball..... 454.1 |
| Gibbon..... 180.0 | Rushnell..... 466.0 |
| Kearney..... 192.7 | Pine Bluffs..... 476.0 |
| Odessa..... 201.8 | Egbert..... 486.1 |
| Elm Creek..... 208.7 | Burns..... 492.6 |
| Overton..... 217.9 | Hilldale..... 500.4 |
| Lexington..... 229.1 | Archer..... 511.8 |
| Cosad..... 247.1 | Cheyenne..... 520.8 |

CHEYENNE-SALT LAKE CITY.

| Miles | Miles |
|--------------------------|----------------------------|
| Cheyenne..... 0.0 | Latham Station..... 212.2 |
| Corlett Station..... 5.7 | Wamsutter..... 220.2 |
| Borie Tower..... 9.3 | Tipton Station..... 236.5 |
| Otto Station..... 14.2 | Point of Rocks..... 265.2 |
| Granite Canyon..... 18.7 | Traver Junction..... 272.5 |
| | Rock Springs..... 281.7 |

| | |
|----------------------------|------------------------------|
| Buford..... 27.2 | Green River..... 296.5 |
| Sherman Hill..... 32.8 | Bryan Station..... 309.8 |
| The Siding..... 39.2 | Grainger Junction..... 325.6 |
| Laramie..... 57.0 | Lyman..... 354.2 |
| Boaler..... 76.4 | Ft. Bridger..... 359.8 |
| Lookout..... 85.1 | Evanson..... 395.2 |
| Harper..... 90.6 | Wyuta Station..... 396.2 |
| Rock River..... 96.8 | Wasatch..... 405.1 |
| Medicine Bow..... 116.8 | Castle Rock..... 413.4 |
| Carbon..... 127.0 | Emory Station..... 420.3 |
| Evansville..... 135.3 | Main Forks..... 429.3 |
| Hanna..... 139.5 | Coalville..... 441.2 |
| Walcott..... 155.5 | Hoytville..... 444.3 |
| Ft. Steele..... 163.1 | Wanship..... 449.1 |
| Lakota..... 169.6 | Kimball's Ranch..... 459.1 |
| Granville..... 173.4 | Roach's Ranch..... 460.2 |
| Rawlins..... 178.7 | Salt Lake City..... 483.5 |
| Creston Station..... 208.2 | |

SALT LAKE CITY-ELY.

| Miles | Miles |
|--------------------------|---------------------------|
| Salt Lake City..... 0.0 | Orr's Ranch..... 97.3 |
| Pleasant Green..... 15.0 | County Well..... 104.2 |
| Ragtown..... 16.1 | Flash Springs..... 146.2 |
| Garfield..... 20.3 | Caliao..... 166.6 |
| Iake Point..... 28.1 | Ibapath..... 192.2 |
| Milltown..... 30.3 | Tippett..... 215.8 |
| Grantsville..... 40.3 | Anderson's R'h..... 237.8 |
| Timpie Point..... 54.3 | Shellbourne..... 244.9 |
| Joseph..... 70.2 | Magnuson's R'h..... 264.9 |
| Brown's Ranch..... 77.3 | McGill..... 273.6 |
| Indian Ranch..... 79.3 | East Ely..... 285.4 |
| Indian Farm..... 84.3 | Ely..... 288.4 |

ELY-RENO.

| Miles | Miles |
|--------------------------|-----------------------------|
| Ely..... 0.0 | Austin Summit..... 151.9 |
| Luna..... 2.4 | Austin..... 154.0 |
| Copper Flat..... 6.9 | New Pass Can-yon..... 181.5 |
| Relpetown..... 8.0 | Alpine Ranch..... 199.7 |
| Kimberly..... 8.7 | Eastgate..... 214.3 |
| Jake's Summit..... 16.2 | Westgate..... 224.1 |
| Mooreman's R'h..... 30.7 | Mountain Well..... 249.3 |
| Roseven's R'h..... 32.7 | Stillwater..... 264.2 |
| White Pine..... 38.7 | Fallon..... 278.7 |
| Summit..... 44.2 | Hazen..... 295.6 |
| Six Mile House..... 50.0 | Fernley..... 306.1 |
| 14 Mile House..... 69.8 | Wadsworth..... 311.3 |
| Pinto House..... 76.4 | Derby..... 316.8 |
| Eureka..... 83.6 | Vista Station..... 338.6 |
| Rigley Ranch..... 96.9 | Sparks..... 342.4 |
| Grimes' Ranch..... 124.9 | Reno..... 347.8 |

RENO-SAN FRANCISCO.

| Miles | Miles |
|------------------------------|--------------------------|
| Reno..... 0.0 | Roseville..... 122.0 |
| Verdi..... 10.7 | Sacramento..... 139.7 |
| Truckee..... 32.7 | Elk Grove..... 152.7 |
| Donner..... 37.7 | McConnell..... 157.7 |
| Emigrant Gap..... 62.7 | Arno..... 159.7 |
| Dutch Flat or Alta..... 75.8 | Galt..... 165.7 |
| Gold Run..... 79.0 | Woodbridge..... 173.7 |
| Colfax..... 89.0 | Stockton..... 187.7 |
| Wyman..... 92.2 | French Camp..... 192.9 |
| Applegate..... 95.0 | Banta..... 204.4 |
| Auburn..... 104.5 | Altamont..... 221.0 |
| New Castle..... 109.3 | Tracy..... 208.1 |
| Penryn..... 112.6 | Livermore..... 229.7 |
| Loomis..... 114.4 | Hayward..... 257.2 |
| Rocklin..... 117.0 | Oakland..... 263.9 |
| | San Francisco..... 267.9 |

RENO-SACRAMENTO.

| Miles | Miles |
|--------------------------------|-----------------------------|
| Reno..... 0.0 | Sportsman's Hall..... 106.6 |
| Steamh't Spgs..... 10.1 | Cimino..... 110.9 |
| Washoe..... 15.1 | Placerville..... 117.6 |
| Franktown..... 20.1 | Eldorado..... 125.0 |
| Carson City..... 31.7 | Shingle Springs..... 129.9 |
| Glenbrook..... 47.1 | Clarksville..... 137.5 |
| Cave Rock..... 50.1 | White Rock..... 141.0 |
| Edgewood..... 56.7 | Folsom..... 147.1 |
| Lakeside Park..... 57.8 | Natoma..... 148.3 |
| Sierra Nevada Summit..... 65.7 | Mills..... 157.1 |
| Phillips..... 68.9 | Mayhew..... 160.0 |
| Strawberry..... 76.1 | Manlove..... 161.1 |
| Kyburas..... 85.8 | Perkins..... 163.2 |
| Riverton..... 95.3 | Sacramento..... 168.4 |

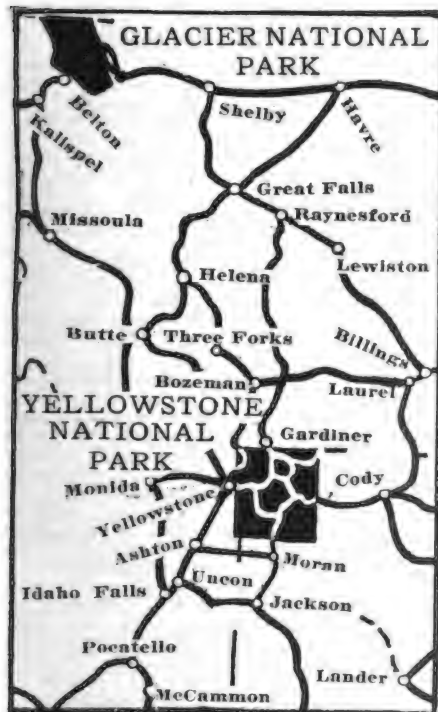
YELLOWSTONE TRAIL

ITINERARY.

Night Stops—Plymouth, Mass.; Hartford, Conn.; Poughkeepsie, Binghamton, N. Y.; Youngstown, O.; Fort Wayne, Ind.; Chicago, Ill.; Milwaukee, Wis.; Minneapolis, Minn.; Milbank, Selby, S. D.; Terry, Custer, Livingston, Butte, Missoula, Mont.; Spokane, Walla Walla, Tacoma, Wash. Twenty Days, 3946.4 Miles.

Plymouth-Providence.

| Miles | Miles |
|----------------------|----------------------|
| Plymouth..... 0.0 | E. Providence.. 42.8 |
| Middleboro..... 14.7 | Providence..... 43.8 |
| Taunton..... 25.8 | |



Providence-Hartford.

| Miles | Miles |
|---------------------|-----------------------|
| Providence..... 0.0 | Willimantic..... 56.0 |
| Chepachet..... 15.4 | Andover..... 65.3 |
| Pomfret..... 32.1 | Hartford..... 84.0 |

Hartford-Danbury.

| Miles | Miles |
|----------------------|----------------------|
| Hartford..... 0.0 | N. Milford..... 38.9 |
| Plainville..... 13.8 | Brookfield..... 61.7 |
| Bantam..... 38.2 | Danbury..... 69.0 |

Danbury-Poughkeepsie, N. Y.

| Miles | Miles |
|----------------------|----------------------|
| Danbury..... 0.0 | Stormville..... 27.9 |
| Mill Plain..... 3.9 | Fishkill P..... 34.1 |
| Brewster, N. Y. 10.0 | N. Hackensack. 37.7 |
| Carmel..... 14.5 | Poughkeepsie.. 45.1 |

Poughkeepsie-Kingston, N. Y.

| Miles | Miles |
|---------------------|----------------------|
| Poughkeepsie.. 0.0 | Rhinecliff..... 18.5 |
| Hyde Park..... 6.1 | Rondout F..... 18.6 |
| Rhinebeck..... 16.2 | Kingston..... 22.0 |

Kingston-Binghamton.

| Miles | Miles |
|--------------------|--------------------|
| Kingston..... 0.0 | Afton..... 126.3 |
| Arkville..... 57.8 | Ninevah..... 181.6 |

| | |
|-----------------------|----------------------|
| Delgo..... 83.3 | Belden..... 136.9 |
| Unadilla..... 100.9 | Sanitary Spa.. 142.6 |
| Bainbridge..... 120.4 | Binghamton... 153.7 |

Binghamton-Elmira.

| Miles | Miles |
|---------------------|-------------------|
| Binghamton... 0.0 | Waverly..... 45.0 |
| Owego..... 24.3 | Lowman..... 55.6 |
| Smithboro..... 35.2 | Elmira..... 63.6 |

Elmira-Salamanca.

| Miles | Miles |
|--------------------|---------------------|
| Elmira..... 0.0 | Almond..... 67.1 |
| Corning..... 18.6 | Alfred Sta.... 70.8 |
| Addison..... 30.2 | Andover..... 79.8 |
| Cameron..... 43.2 | Bolivar..... 101.0 |
| Canisteo..... 56.5 | Salamanca.... 138.2 |
| Hornell..... 61.8 | |

Salamanca, N. Y.-Youngstown, O.

| Miles | Miles |
|---------------------|---------------------|
| Salamanca..... 0.0 | Mercer..... 168.0 |
| Warren..... 65.0 | Youngstown... 210.0 |
| Franklin..... 128.0 | |

Youngstown-Akron, O.

| Miles | Miles |
|--------------------|-------------------|
| Youngstown... 0.0 | Ravenna..... 32.6 |
| Edinburg..... 25.9 | Akron..... 50.0 |

Akron-Ft. Wayne, Ind.

| Miles | Miles |
|---------------------|----------------------|
| Akron..... 0.0 | Ottawa..... 147.8 |
| Oberlin..... 46.7 | Du Pont..... 162.8 |
| Bellevue..... 83.0 | Paulding..... 178.0 |
| Fostoria..... 118.8 | Ft. Wayne..... 218.9 |

Ft. Wayne-Chicago.

| Miles | Miles |
|----------------------|----------------------|
| Ft. Wayne..... 0.0 | Vauparaiso.... 118.2 |
| Columbia City.. 20.5 | East Chicago.. 146.2 |
| Warsaw..... 42.9 | Hammond..... 149.2 |
| Plymouth..... 72.5 | Chicago..... 170.2 |

Chicago-Milwaukee.

| Miles | Miles |
|--------------------|----------------------|
| Chicago..... 0.0 | Kenosha..... 62.3 |
| Evanston..... 13.1 | Racine..... 73.0 |
| Highland Pk.. 26.0 | S. Milwaukee... 87.0 |
| Waukegan..... 46.5 | Milwaukee..... 96.4 |

Milwaukee-Minneapolis.

| Miles | Miles |
|----------------------|----------------------|
| Milwaukee..... 0.0 | Stanley..... 229.0 |
| Fond du Lac... 62.0 | Eau Claire.... 259.5 |
| Oshkosh..... 81.0 | St. Paul..... 358.7 |
| Stevens Pt.... 140.3 | Minneapolis... 368.7 |

Minneapolis-Milbank.

| Miles | Miles |
|--------------------|-----------------------|
| Excelsior..... 0.0 | Sacred Heart... 122.9 |
| Waconia..... 31.1 | Granite Falls.. 131.9 |
| Brownton..... 67.9 | Ortonville..... 205.4 |
| Hector..... 86.9 | Milbank..... 219.9 |

Milbank-Selby.

| Miles | Miles |
|--------------------|--------------------|
| Milbank..... 0.0 | Ipswich..... 127.0 |
| Webster..... 45.0 | Bowdle..... 157.0 |
| Aberdeen..... 97.0 | Selby..... 180.0 |

Selby-Hettinger.

| Miles | Miles |
|--------------------|----------------------|
| Selby..... 0.0 | McIntosh..... 110.5 |
| Mobridge..... 35.0 | Hettinger..... 197.5 |

Hettinger-Terry.

| Miles | Miles |
|--------------------|------------------|
| Hettinger..... 0.0 | Baker..... 158.5 |
| Bowman..... 72.0 | Terry..... 260.5 |
| Martin..... 115.5 | |

Terry-Custer.

| Miles | Miles |
|----------------------|-------------------|
| Terry..... 0.0 | Forsyth..... 90.9 |
| Miles City..... 39.3 | Custer..... 142.6 |

Custer-Livingston.

| Miles | Miles |
|--------------------|----------------------|
| Custer..... 0.0 | Reed Point.... 124.7 |
| Billings..... 57.7 | Livingston.... 185.5 |

Livingstone-Butte.

| Miles | Miles |
|---------------------|----------------------|
| Livingston..... 0.0 | Whitchall..... 105.1 |
| Roseman..... 26.7 | Butte..... 139.2 |
| Three Forks... 61.5 | |

Butte-Drummond.

| Miles | Miles |
|---------------------|--------------------|
| Butte..... 0.0 | Garrison..... 63.8 |
| Anaconda..... 26.8 | Drummond..... 86.0 |
| Deer Lodge.... 52.3 | |

Drummond-Wallace.

| Miles | Miles |
|---------------------|--------------------|
| Drummond..... 0.0 | Missoula..... 58.1 |
| Bearmount..... 13.5 | Wallace..... 181.5 |

Wallace-Spokane.

| Miles | Miles |
|-------------------|----------------------|
| Wallace..... 0.0 | Coeur D'Alene.. 52.3 |
| Kellogg..... 11.6 | Spokane..... 86.0 |

Spokane-Walla Walla.

| Miles | Miles |
|------------------|-------------------|
| Spokane..... 0.0 | Dayton..... 143.5 |



| | |
|--------------------|----------------------|
| Colfax..... 80.2 | Walla Walla... 176.4 |
| Pomeroy..... 115.0 | |

Walla Walla-North Yakima.

| Miles | Miles |
|--------------------|----------------------|
| Walla Walla... 0.0 | Pronser..... 78.0 |
| Sudbury..... 7.0 | Grandview..... 91.0 |
| Divide..... 26.0 | Yakima..... 127.0 |
| Walla..... 29.0 | North Yakima.. 132.0 |
| Kennewick.... 45.0 | |
| Kiona..... 63.0 | |

North Yakima-Cle Elum.

| Miles | Miles |
|--------------------|---------------------|
| North Yakima.. 0.0 | Thorp..... 53.0 |
| Pomona..... 9.0 | Teamaway..... 65.0 |
| Wenas..... 27.0 | South Cle Elum 69.0 |
| Ellensburg... 41.0 | Cle Elum..... 72.0 |

Cle Elum-Tacoma.

| Miles | Miles |
|---------------------|-----------------------|
| Cle Elum..... 0.0 | Isaquak..... 90.0 |
| Nelson..... 16.0 | South Park.... 109.0 |
| Laconia..... 43.0 | Seattle..... 114.0 |
| Edgewick..... 61.0 | Christopher.... 148.0 |
| Fall City..... 79.0 | Tacoma..... 154.0 |

PIKE'S PEAK HIGHWAY

ITINERARY.

Night Stops—New York; Reading, Altoona, Pittsburgh, Pa.; Columbus, O.; Indianapolis, Ind.; Decatur, Quincy, Ill.; Brookfield, Mo.; Belleville, Norton, Kan.; Burlington, Colorado Springs, Leadville, Glenwood Springs, Rangeley, Col.; Colton, Salt Lake City, Snowville, Utah; Wells, Battle Mountain, Lovelock, Nev.; Truckee, Sacramento, San Francisco, Cal. Twenty-Five Days, 3594.2 Miles.

New York-Reading.

| Miles | Miles |
|----------------------|----------------------|
| New York..... 0.0 | Easton 75.9 |
| Newark 10.6 | Bethlehem 87.4 |
| Morristown..... 30.3 | Allentown 93.1 |
| German Valley 47.4 | Kutztown 111.0 |
| Washington... 62.9 | Reading 128.3 |

Reading-Altoona.

| Miles | Miles |
|---------------------|------------------------|
| Reading 0.0 | Newport 79.9 |
| Stouchsburg... 17.0 | Mexico 97.4 |
| Lebanon 27.8 | Lewistown 112.0 |
| Hummelstown... 43.9 | Belleville 127.6 |
| Harrisburg... 53.4 | Alexandra 156.1 |
| Clark's Ferry. 67.9 | Altoona 190.1 |

Altoona-Pittsburgh.

| Miles | Miles |
|--------------------|-----------------------|
| Altoona 0.0 | N. Alexandria. 66.6 |
| Holidaysburg.. 7.0 | Delmont 74.5 |
| Summit 17.4 | Wilkinsburg .. 92.7 |
| Clyde 47.5 | Pittsburgh 99.7 |

Pittsburgh-Columbus.

| Miles | Miles |
|----------------------|------------------------|
| Pittsburgh 0.0 | N. Conestown 112.1 |
| Florence 24.4 | Franklin 130.6 |
| Holiday Cove.. 36.7 | Dresden 141.7 |
| Staubenville... 44.7 | Newark 165.1 |
| Cadiz 65.8 | Columbus 179.1 |
| Uhrichsville... 87.0 | Columbia C. 183.1 |

Columbus-Indianapolis.

| Miles | Miles |
|----------------------|------------------------|
| Columbus 0.0 | Richmond 110.1 |
| Brighton 30.2 | Germanstown.. 124.3 |
| Springfield ... 44.1 | Ogden 142.0 |
| Fairfield 57.0 | Greenfield 156.2 |
| Dayton 68.1 | Cumberland 168.6 |
| Eaton 93.1 | Indianapolis ... 179.0 |

Indianapolis-Decatur.

| Miles | Miles |
|---------------------|---------------------|
| Indianapolis .. 0.0 | Chrisman 85.3 |

| | |
|----------------------|---------------------|
| Danville 19.7 | Newman 103.5 |
| Bainbridge ... 36.9 | Tuscola 122.4 |
| Rockville 59.1 | Hammond 141.2 |
| Montesuma ... 67.7 | Decatur 164.8 |

Decatur-Quincy.

| Miles | Miles |
|-----------------------|-----------------------|
| Decatur 0.0 | Beardstown ... 100.9 |
| Buffalo 25.2 | Rushville 114.0 |
| Springfield ... 40.8 | Mt. Sterling... 131.7 |
| Berlin 55.9 | Clayton 144.5 |
| Jacksonville ... 73.4 | Camp Point.... 150.6 |
| Concord 84.6 | Quincy 174.7 |

Quincy-Brookfield.

| Miles | Miles |
|---------------------|-----------------------|
| Quincy 0.0 | Clarence 79.1 |
| Hannibal 18.7 | Macon City.... 91.7 |
| Monroe City... 45.7 | Bucklin 120.1 |
| Shelbina 66.0 | Brookfield 131.3 |

Brookfield-St. Joseph.

| Miles | Miles |
|----------------------|-----------------------|
| Brookfield 0.0 | Hamilton 57.3 |
| Wheeling 18.4 | Cameron 72.4 |
| Chillicothe ... 29.0 | St. Joseph..... 107.3 |

St. Joseph-Belleville.

| Miles | Miles |
|---------------------|------------------------|
| St. Joseph..... 0.0 | Seneca 85.8 |
| Troy 14.8 | Beattie 113.0 |
| Highland 35.2 | Marysville 121.1 |
| Hiawatha 49.5 | Washington ... 148.9 |
| Sabetha 68.0 | Belleville 165.5 |

Belleville-Norton.

| Miles | Miles |
|----------------------|-----------------------|
| Belleville 0.0 | Kensington ... 79.3 |
| Courtland 16.7 | Phillipsburg .. 95.5 |
| Mankato 34.0 | Prairie View... 113.5 |
| Smith Center... 63.2 | Norton 138.0 |

Norton-Burlington.

| Miles | Miles |
|---------------------|-----------------------|
| Norton 0.0 | Colby 96.3 |
| Dellvale 21.5 | Brewster 115.0 |
| Jennings 40.2 | Goodland 133.3 |
| Selden 63.2 | Burlington 163.7 |

Burlington-Colorado Springs.

| Miles | Miles |
|----------------------|-----------------------|
| Burlington 0.0 | Limon 83.9 |
| Stratton 18.4 | Mattison 105.5 |
| Selbert 34.7 | Calhan 127.8 |
| Arriba 58.7 | Falcon 149.1 |
| Genoa 70.6 | Colorado Spr'gs 168.6 |

Colorado Springs-Leadville.

| Miles | Miles |
|---------------------|-----------------------|
| Colorado Spr'gs 0.0 | Bath 75.3 |
| Edlowe 20.6 | Buena Vista... 93.5 |
| Pulvero 48.1 | Granite 111.1 |
| Hartsel 63.5 | Leadville 135.2 |

Leadville-Glenwood Springs.

| Miles | Miles |
|---------------------|----------------------|
| Leadville 0.0 | Wolcott 48.3 |
| Pando 16.0 | Gypsum 65.8 |
| Redcliff 22.6 | Glenwd. Springs 90.8 |

Glenwood Springs-Rangeley.

| Miles | Miles |
|--------------------|----------------------|
| Glenwd Springs 0.0 | Meeker 75.9 |
| Rifle 33.4 | Rangeley 136.9 |

Rangeley-Colton.

| Miles | Miles |
|--------------------|----------------------|
| Rangeley 0.0 | Roosevelt 59.7 |
| K Ranch..... 22.0 | Duchesne 121.9 |
| Vernal 57.3 | Colton 172.5 |

Colton-Salt Lake City.

| Miles | Miles |
|---------------------|-----------------------|
| Colton 0.0 | Provo 57.8 |
| Thistle 33.7 | Alpine 71.5 |
| Spanish Forks. 47.0 | Salt Lake City. 103.1 |

Salt Lake City-Snowville.

| Miles | Miles |
|----------------------|-----------------------|
| Salt Lake City.. 0.0 | Honeyville 73.9 |
| Ogden 37.9 | Blind Springs.. 89.8 |
| Brigham City.. 60.1 | Snowville 117.3 |

Snowville-Wells.

| Miles | Miles |
|---------------------|----------------------|
| Snowville 0.0 | Montello 111.6 |
| Lucia 94.2 | Wells 166.2 |

Wells-Battle Mountain.

| Miles | Miles |
|------------------|------------------------|
| Wells 0.0 | Carlin 79.0 |
| Death 20.5 | Richmond Mine 94.9 |
| Elko 56.4 | Battle Mtn. 133.0 |

Battle Mountain-Lovelock.

| Miles | Miles |
|----------------------|----------------------|
| Battle Mtn 0.0 | Mill City 85.6 |
| Golconda 40.0 | Humboldt 99.2 |
| Winnemucca... 57.0 | Lovelock 132.4 |

Lovelock-Truckee.

| Miles | Miles |
|--------------------|---------------------|
| Lovelock 0.0 | Verdi 119.7 |
| Wadsworth ... 75.8 | Truckee 143.1 |
| Reno 107.8 | |

Truckee-Sacramento.

| Miles | Miles |
|--------------------|-----------------------|
| Truckee 0.0 | Auburn 76.5 |
| Emigrant Gap. 32.6 | Folsom 95.6 |
| Colfax 58.5 | Sacramento 117.4 |

Sacramento-San Francisco.

| Miles | Miles |
|---------------------|----------------------|
| Sacramento ... 0.0 | Livermore 95.1 |
| Lodi 36.6 | Oakland 130.7 |
| Stockton 52.4 | San Francisco. 136.2 |

NATIONAL OLD TRAILS

ITINERARY.

Night Stops—New York City, Philadelphia, Washington, D. C.; Cumberland, Md.; Wheeling, W. Va.; Columbus, O.; Indianapolis, Terre Haute, Ind.; St. Louis, Columbus, Mo.; Kansas City, Emporia, Hutchinson, Dodge City, Sy-

racuse, Kan.; La Junta, Trinidad, Col.; Las Vegas, Santa Fe, Albuquerque, McCarty's, Gallup, N. M.; Holbrook, Flagstaff, Kingman, Ariz.; Amboy, San Bernadino, Los Angeles, Santa Barbara, Pasa Robles, Santa Cruz, San Francisco, Cal. Thirty-one Days, 3726 Miles.

New York-Philadelphia.

| Miles | Miles |
|----------------------|----------------------|
| New York..... 0.0 | Monmouth Jet. 46.8 |
| Jersey City.... 6.3 | Trenton 63.4 |
| Newark 12.2 | Oxford Valley. 70.0 |
| Elizabeth 18.0 | Hulmeville 73.6 |
| Rahway 23.1 | Andalusia 78.9 |
| Iselin 27.4 | Torresdale 81.1 |
| Metuchen 31.4 | Holmesburg ... 83.4 |
| New Brunswick 36.0 | Philadelphia .. 95.6 |

Philadelphia-Washington.

| Miles | Miles |
|-----------------------|----------------------|
| Philadelphia .. 0.0 | Perryville .. 60.9 |
| Darby .. 6.3 | Webster .. 68.0 |
| Glendale .. 8.2 | Churchville .. 70.5 |
| Norwood .. 9.3 | Belair .. 76.3 |
| Eddystone .. 12.5 | Kingsville .. 83.5 |
| Chester .. 13.6 | Carney .. 89.7 |
| Marcus Hook .. 18.5 | Baltimore .. 100.4 |
| Claymont .. 20.1 | Elkridge .. 109.4 |
| Holly Oak .. 21.2 | Laurel .. 121.4 |
| Wilmington .. 26.4 | Contee .. 123.4 |
| Elsemere Jet. .. 29.5 | Beltsville .. 126.9 |
| Marshalltown .. 32.0 | Hyattsville .. 133.4 |
| Newark .. 40.0 | Bladensburg .. 133.9 |
| Elkton, Md. .. 46.6 | Washington .. 139.4 |

Washington-Cumberland.

| Miles | Miles |
|---------------------|----------------------|
| Washington .. 0.0 | Benevola .. 62.7 |
| Bethesda .. 7.4 | Hagerstown .. 70.7 |
| Rockville .. 15.3 | Hancock .. 97.7 |
| Galtherburg .. 20.5 | Bellegrove .. 110.7 |
| Clarksburg .. 28.5 | Piney Grove .. 114.7 |
| Hyattstown .. 32.4 | Pratt .. 122.7 |
| Frederick .. 43.7 | Gilpen .. 125.7 |
| Middletown .. 51.7 | Flintstone .. 126.7 |
| Boonsboro .. 59.7 | Cumberland .. 139.7 |

Cumberland-Wheeling.

| Miles | Miles |
|----------------------|----------------------|
| Cumberland .. 0.0 | Summit .. 50.0 |
| Frostburg .. 11.0 | Uniontown .. 62.0 |
| Grantville .. 25.0 | Brownsville .. 74.0 |
| Keyser Ridge .. 31.0 | Scenery Hill .. 86.0 |
| Addison .. 36.0 | Washington .. 99.0 |
| Somerfield .. 40.0 | Claysville .. 109.0 |
| Farmington .. 50.0 | Wheeling .. 132.0 |

Wheeling-Columbus.

| Miles | Miles |
|-------------------------|---------------------|
| Wheeling .. 0.0 | Norwich .. 60.5 |
| Bridgeport .. 1.3 | Zanesville .. 72.4 |
| St. Clairsville .. 10.0 | Sterling .. 80.5 |
| Lloydsville .. 16.1 | Brownsville .. 86.3 |
| Marriestown .. 19.9 | Linnville .. 91.0 |
| Headricksburg .. 25.6 | Jacktown .. 95.0 |
| Fairview .. 29.0 | Hebron .. 99.0 |
| Washington .. 40.6 | Kirksville .. 105.0 |
| Cambridge .. 49.0 | Etna .. 111.6 |
| New Concord .. 57.3 | Columbus .. 125.1 |

Columbus-Indianapolis.

| Miles | Miles |
|----------------------|-------------------------|
| Columbus .. 0.0 | Dayton .. 67.4 |
| Alton .. 9.4 | New Lebanon .. 78.3 |
| W. Jefferson .. 14.4 | Johnsville .. 80.2 |
| Lafayette .. 21.8 | W. Alexandria .. 86.2 |
| Summerford .. 26.5 | Eaton, O. .. 91.7 |
| Brighton .. 30.3 | Richmond, Ind. .. 107.6 |
| Vienna .. 32.9 | Centerville .. 113.7 |
| Harmony .. 37.5 | Cambridge City .. 123.0 |
| Springfield .. 43.4 | Lewisville .. 132.5 |
| Enon .. 51.3 | Knightstown .. 142.2 |
| Fairfield .. 57.4 | Greenfield .. 155.2 |
| Harshman .. 63.7 | Indianapolis .. 176.4 |

Indianapolis-Terre Haute.

| Miles | Miles |
|----------------------|---------------------|
| Indianapolis .. 0.0 | Coatsville .. 40.0 |
| Bridgeport .. 9.0 | Reelsville .. 45.9 |
| Plainfield .. 13.8 | Harmony .. 51.8 |
| Belleville .. 18.7 | Brasil .. 54.0 |
| Stilesville .. 26.9 | Seeleyville .. 62.5 |
| Mt. Meridian .. 33.9 | Terre Haute .. 70.4 |

Terre Haute-St. Louis.

| Miles | Miles |
|------------------------|---------------------|
| Terre Haute .. 0.0 | Vandalia .. 100.2 |
| Marshall, Ill. .. 16.8 | Hagerstown .. 104.5 |
| Martinsville .. 27.6 | Mulberry .. 111.3 |
| Casey .. 33.9 | Greenville .. 120.0 |

| | |
|--------------------|-------------------------|
| Greenup .. 43.7 | Pocahontas .. 130.0 |
| Teutopolis .. 62.1 | Highland .. 139.0 |
| Effingham .. 66.0 | Collinsville .. 160.0 |
| Altamont .. 80.4 | St. Louis, Mo. .. 172.0 |

St. Louis-Columbia.

| Miles | Miles |
|---------------------|----------------------|
| St. Louis .. 0.0 | Warrenton .. 65.9 |
| Wellston .. 6.4 | Jonesburg .. 75.7 |
| Pattonville .. 14.4 | Danville .. 88.7 |
| St. Charles .. 19.8 | Mincola .. 91.4 |
| Colterville .. 30.8 | Calwood .. 109.1 |
| Wentzville .. 45.1 | Fulton .. 117.0 |
| Fortatell .. 52.1 | Millersburg .. 125.1 |
| Wright .. 56.6 | Columbia .. 140.7 |

Columbia-Kansas City.

| Miles | Miles |
|----------------------|-----------------------|
| Columbia .. 0.0 | Dover .. 103.5 |
| Reheport .. 14.4 | Lexington .. 114.5 |
| New Franklin .. 30.1 | Wellington .. 121.5 |
| Booneville .. 33.1 | Levasy .. 132.3 |
| Arrow Rock .. 53.6 | Independence .. 150.2 |
| Marshall .. 70.5 | Centropolis .. 154.4 |
| Waverly .. 92.3 | Kansas City .. 159.2 |

Kansas City-Emporia.

| Miles | Miles |
|---------------------|----------------------|
| Kansas City .. 0.0 | Ottawa .. 71.2 |
| Martin City .. 16.4 | Williamsburg .. 85.4 |
| Olathe .. 28.8 | Waverly .. 101.5 |
| Edgerton .. 46.7 | Emporia .. 134.1 |

Emporia-Hutchinson.

| Miles | Miles |
|--------------------|---------------------|
| Emporia .. 0.0 | Florence .. 45.8 |
| Oottonwood .. 21.8 | Peabody .. 63.7 |
| Elmdale .. 28.0 | Halstead .. 95.2 |
| Clements .. 35.7 | Hutchinson .. 122.3 |

Hutchinson-Dodge City.

| Miles | Miles |
|-------------------|---------------------|
| Hutchinson .. 0.0 | Great Bend .. 68.0 |
| Sterling .. 24.9 | Kingsley .. 115.7 |
| Lyons .. 34.4 | Spearville .. 137.7 |
| Chase .. 44.1 | Dodge City .. 154.8 |
| Ellinwood .. 57.6 | |

Dodge City-Syracuse.

| Miles | Miles |
|---------------------|-------------------|
| Dodge City .. 0.0 | Lakin .. 78.1 |
| Colmaron .. 19.2 | Kendall .. 95.0 |
| Ingalis .. 26.2 | Syracuse .. 107.4 |
| Garden City .. 53.0 | |

Syracuse-La Junta.

| Miles | Miles |
|-----------------|--------------------|
| Syracuse .. 0.0 | Prowers .. 65.4 |
| Holly .. 22.0 | Las Animas .. 93.7 |
| Granada .. 39.7 | La Junta .. 115.5 |
| Lamar .. 57.3 | |

La Junta-Trinidad.

| Miles | Miles |
|------------------|------------------|
| La Junta .. 0.0 | Kadrew .. 76.2 |
| Timpas .. 23.3 | El Mora .. 87.6 |
| Thatcher .. 54.8 | Trinidad .. 91.3 |

Trinidad-Las Vegas.

| Miles | Miles |
|----------------------|---------------------|
| Trinidad .. 0.0 | Springer .. 69.7 |
| Raton, N. M. .. 25.4 | Wagon Mound .. 97.6 |
| Maxwell .. 54.1 | Watrous .. 120.5 |
| French .. 58.9 | Las Vegas .. 141.0 |

Las Vegas-Santa Fe.

| Miles | Miles |
|------------------|-------------------|
| Las Vegas .. 0.0 | Pecos .. 49.5 |
| Tecolote .. 12.0 | Glorieta .. 55.6 |
| Bernal .. 18.2 | Canoncito .. 60.0 |
| Pajarita .. 40.5 | Santa Fe .. 75.2 |
| Rowe .. 42.8 | |

Santa Fe-Albuquerque.

| Miles | Miles |
|-------------------|---------------------|
| Santa Fe .. 0.0 | Sandia .. 52.5 |
| Domingo .. 26.9 | Alameda .. 54.7 |
| Algodones .. 41.3 | Albuquerque .. 63.7 |

Albuquerque-McCarty's.

| Miles | Miles |
|--------------------|---------------------|
| Albuquerque .. 0.0 | Casa Blanca .. 55.1 |
| Atrisco .. 3.3 | McCarty's .. 82.2 |
| Laguna .. 48.3 | |

McCarty's-Gallup.

| Miles | Miles |
|-------------------|------------------|
| McCarty's .. 0.0 | Thoreau .. 43.0 |
| Grant's .. 13.0 | Gonzales .. 50.0 |
| Totoc .. 17.0 | Guam .. 54.0 |
| Bluewater .. 25.0 | Perea .. 58.0 |
| Baca .. 33.0 | Wingate .. 64.0 |
| Chaves .. 40.0 | Gallup .. 76.0 |

Gallup-Holbrook.

| Miles | Miles |
|------------------------------|---------------------------|
| Gallup .. 0.0 | Pinto .. 68.0 |
| St. Michael's, Ariz. .. 26.0 | Petrified Forest .. 102.0 |
| Wide Ruins .. 56.0 | Carrizozo .. 111.0 |
| Navajo .. 81.0 | Holbrook .. 124.0 |

Holbrook-Flagstaff.

| Miles | Miles |
|-----------------|--------------------|
| Holbrook .. 0.0 | Tolchaco .. 75.4 |
| Winslow .. 36.0 | Flagstaff .. 117.0 |
| Leupp .. 64.6 | |

Flagstaff-Kingman.

| Miles | Miles |
|-------------------------|--------------------------|
| Flagstaff .. 0.0 | Pica .. 101.0 |
| Riorden .. 7.0 | Yampai .. 104.0 |
| Bellemont .. 12.0 | Field's Station .. 108.0 |
| Maine .. 20.0 | Peach Springs .. 120.0 |
| Chalender .. 24.0 | Cherokee .. 126.0 |
| Williams .. 36.0 | Truxton .. 132.0 |
| McClellan .. 44.0 | Valentine .. 139.0 |
| Ash Fork .. 56.0 | Hackberry .. 144.0 |
| Pineveta S'tion .. 64.0 | Antares .. 151.0 |
| Crookton .. 69.0 | Hualpai .. 155.0 |
| Sellgman .. 81.0 | Louise .. 172.0 |
| Chino .. 85.0 | Kingman .. 174.0 |

Kingman-Amboy.

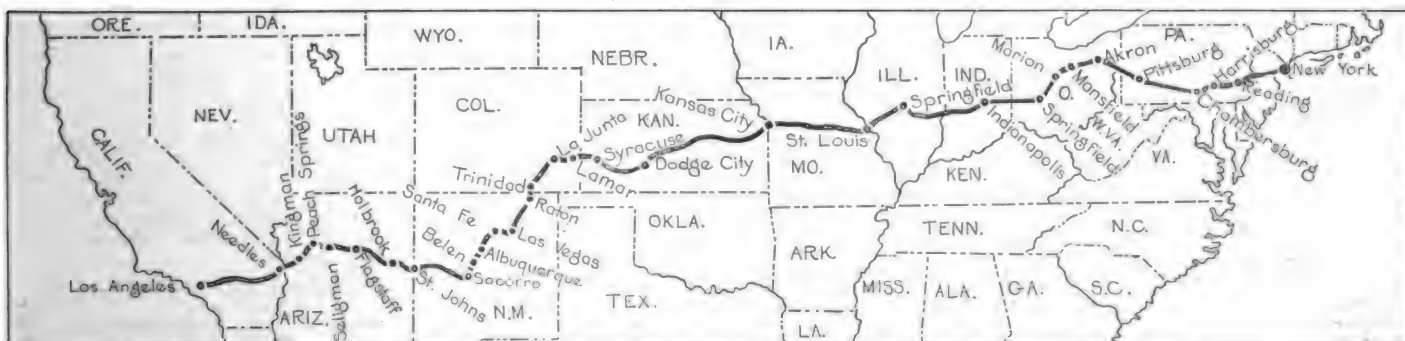
| Miles | Miles |
|---------------------|-----------------|
| Kingman .. 0.0 | Homer .. 94.9 |
| McConico .. 4.0 | Goff's .. 102.0 |
| Yucca .. 25.0 | Fenner .. 111.0 |
| Topock .. 55.0 | Danby .. 127.0 |
| Needles .. 71.0 | Cadis .. 140.0 |
| Klinefelter .. 83.0 | Amboy .. 154.0 |

Amboy-San Bernadino.

| Miles | Miles |
|------------------|--------------------------|
| Amboy .. 0.0 | Todd .. 88.0 |
| Bagdad .. 7.0 | Hicks .. 94.0 |
| Ash Hill .. 21.0 | Hellen .. 103.0 |
| Ludlow .. 28.0 | Oro Grade .. 113.0 |
| Lavie .. 37.0 | Victorville .. 119.0 |
| Plagah .. 42.0 | Heaporia .. 127.0 |
| Hector .. 47.0 | Cajon .. 140.0 |
| Newberry .. 61.0 | Cosy Dell Store .. 142.0 |
| Mincola .. 67.0 | Devore Store .. 149.0 |
| Daggett .. 73.0 | Vermont .. 151.0 |
| Barstow .. 82.0 | San Bernadino .. 160.0 |

San Bernadino-Los Angeles.

| Miles | Miles |
|-----------------------|---------------------|
| San Bernadino .. 0.0 | Pomona .. 46.4 |
| Riverside .. 10.9 | Lemon .. 54.8 |
| Bloomington .. 18.7 | San Marino .. 72.7 |
| Etiwanda .. 30.9 | Le Senda .. 74.7 |
| N. Cuckamonga .. 34.9 | Pasadena .. 79.1 |
| Upland .. 38.5 | Los Angeles .. 89.9 |



DIXIE HIGHWAY

ITINERARY.

Night Stops — Chicago, Indianapolis, Louisville, Ky.; Nashville, Chattanooga, Atlanta, Macon, Jacksonville, Miami, Gainesville, Tallahassee, Macon, Knoxville, Cincinnati, Toledo, Detroit, Tawas City, Mackinaw, Muskegon, South Bend.

Chicago-Danville, Ill.

| Miles | Miles |
|---------------------|----------------------|
| Chicago..... 0.0 | Watseka..... 84.2 |
| Chicago H'ghts 28.8 | Hoopeston..... 107.2 |
| Momence..... 54.0 | Danville..... 135.8 |

Danville, Ill.-Indianapolis, Ind.

| Miles | Miles |
|----------------------|------------------------|
| Danville..... 0.0 | Brownsburg..... 74.6 |
| Covington, Ind. 12.8 | Indianapolis..... 88.0 |

Indianapolis-Dayton, O.

| Miles | Miles |
|---------------------|--------------------|
| Indianapolis... 0.0 | Eaton, O..... 84.6 |
| Knightstown... 34.2 | Dayton..... 108.6 |
| Richmond, Ind. 68.8 | |

Indianapolis-Louisville, Ky.

| Miles | Miles |
|----------------------|-----------------------|
| Indianapolis... 0.0 | Bedford..... 77.4 |
| Martinsville... 30.7 | Paoletti..... 101.0 |
| Bloomington... 52.8 | Louisville..... 147.6 |

Louisville, Ky.-Mammoth Cave, Ky.

| Miles | Miles |
|----------------------|-----------------------|
| Louisville..... 0.0 | Green River..... 85.2 |
| Mt. Wash'ton... 20.7 | Canmer..... 87.7 |
| Salt River..... 23.9 | Hardyville..... 96.0 |
| Bardstown..... 39.8 | Uno..... 95.0 |
| New Haven..... 55.1 | Bear Wallow..... 90.4 |
| Athertonville.. 57.2 | Cave City..... 105.5 |
| Buffalo..... 69.1 | Mammoth Cave.. 116.3 |
| Magnolia..... 74.7 | |

Louisville-Nashville, Tenn.

| Miles | Miles |
|----------------------|-----------------------|
| Louisville..... 0.0 | Cave City..... 134.1 |
| Ellisbethtown.. 45.3 | Russellville... 194.0 |
| Mumfordsville.. 76.6 | Nashville..... 249.3 |

Nashville-Chattanooga.

| Miles | Miles |
|----------------------|-----------------------|
| Nashville..... 0.0 | Pelham..... 80.4 |
| Laverne..... 15.7 | Tracy City..... 93.9 |
| Murfreesboro... 31.8 | Sequatchie..... 110.3 |
| Beach Grove... 49.0 | Jasper..... 114.2 |
| Manchester..... 63.1 | St. Elmo..... 137.3 |
| Hillsboro..... 71.4 | Chattanooga... 140.1 |

Nashville, Tenn.-Mammoth Cave, Ky.

| Miles | Miles |
|---------------------|-----------------------|
| Nashville..... 0.0 | Adolphus, Ky... 50.0 |
| Gallatin Pike.. 2.0 | Petroleum..... 54.2 |
| Madison..... 7.7 | Scottsville..... 60.4 |
| Edenwood..... 10.6 | Cedar Springs.. 67.3 |
| Hendersville.. 15.5 | Barren River... 71.3 |
| Avondale..... 18.9 | Pageville..... 73.1 |
| Gallatin..... 26.8 | Lucas..... 75.3 |
| Sideview..... 32.7 | Bruce..... 78.3 |
| Bethpage..... 37.0 | Glasgow..... 80.5 |
| Bransford..... 39.6 | Good Night..... 94.3 |
| Bledsoe..... 40.4 | Cave City..... 102.3 |
| Sugar Grove... 49.2 | Mammoth Cave.. 112.6 |

Chattanooga-Atlanta, Ga.

| Miles | Miles |
|---------------------|---------------------|
| Chattanooga... 0.0 | Marietta..... 120.7 |
| Summerville... 45.1 | Atlanta..... 139.0 |
| Rome..... 70.5 | |

Atlanta-Milledgeville.

| Miles | Miles |
|---------------------|-----------------------|
| Atlanta..... 0.0 | Madison..... 70.8 |
| Decatur..... 6.6 | Entonton..... 94.7 |
| Stone Mountain 16.6 | Milledgeville.. 116.3 |



Jupiter-Arcadia, Fla.

| Miles | Miles |
|---------------------|--------------------|
| Jupiter..... 0.0 | Arcadia..... 144.5 |
| Okeechobee.... 54.5 | |

Arcadia-Gainesville, Fla.

| Miles | Miles |
|--------------------|------------------------|
| Arcadia..... 0.0 | Leesburg..... 167.6 |
| Bartow..... 52.5 | Ocala..... 205.9 |
| Orlando..... 116.0 | Gainesville..... 240.8 |

Gainesville-Tallahassee.

| Miles | Miles |
|--------------------|----------------------|
| Gainesville... 0.0 | Perry..... 118.4 |
| Newberry..... 26.0 | Simmons..... 139.4 |
| Trenton..... 40.3 | Lamont..... 150.9 |
| Mayo..... 83.0 | Tallahassee... 181.4 |

Tallahassee-Jacksonville.

| Miles | Miles |
|----------------------|-----------------------|
| Tallahassee... 0.0 | Live Oak..... 83.4 |
| Monticello..... 21.1 | Lake City..... 108.6 |
| Madison..... 54.2 | Jacksonville... 169.8 |

Tallahassee-Macon, Ga.

| Miles | Miles |
|---------------------|-----------------------|
| Tallahassee... 0.0 | Americus..... 129.1 |
| Thomasville... 34.3 | Ft. Valley..... 174.7 |
| Camilla..... 66.5 | Macon..... 201.5 |
| Albany..... 92.2 | |

Macon-Atlanta, Ga.

| Miles | Miles |
|-------------------|-------------------|
| Macon..... 0.0 | Griffin..... 54.7 |
| Forsyth..... 25.2 | Atlanta..... 84.5 |

Atlanta-Chattanooga, Tenn.

| Miles | Miles |
|----------------------|----------------------|
| Atlanta..... 0.0 | Dalton..... 90.2 |
| Cartersville... 41.3 | Chattanooga... 124.6 |

Chattanooga-Knoxville, Tenn.

| Miles | Miles |
|--------------------|----------------------|
| Chattanooga... 0.0 | Kingston..... 84.0 |
| Dayton..... 38.9 | Knoxville..... 131.3 |

Knoxville-Cincinnati, O.

| Miles | Miles |
|-----------------------|-----------------------|
| Knoxville..... 0.0 | Berea..... 168.6 |
| Cumberland Gap 67.6 | Richmond..... 183.3 |
| Middlesboro... 71.4 | Lexington..... 200.1 |
| Barboursville.. 99.1 | Georgetown..... 218.0 |
| Corbin..... 116.1 | Williamstown... 252.5 |
| Lindon..... 132.6 | Covington..... 289.6 |
| Mt. Vernon..... 148.6 | Cincinnati..... 290.5 |

Cincinnati-Toledo, O.

| Miles | Miles |
|---------------------|-----------------------|
| Cincinnati..... 0.0 | Sidney..... 96.6 |
| Middletown... 33.0 | Lima..... 132.0 |
| Dayton..... 56.1 | Findley..... 164.3 |
| Troy..... 76.2 | Bowling Green.. 187.2 |
| Piqua..... 84.2 | Toledo..... 210.0 |

Toledo-Detroit, Mich.

| Miles | Miles |
|--------------------|---------------------|
| Toledo..... 0.0 | Old Port..... 29.9 |
| La Salle..... 16.2 | Wyandotte..... 46.7 |
| Monroe..... 20.7 | Detroit..... 58.4 |

Detroit-Mackinaw, Mich.

| Miles | Miles |
|---------------------|---------------------|
| Detroit..... 0.0 | Alpena..... 271.2 |
| Flint..... 68.0 | Onaway..... 340.0 |
| Bay City..... 118.3 | Mackinaw..... 382.7 |
| Tawas City... 196.8 | |

Mackinaw-South Bend, Ind.

| Miles | Miles |
|-----------------------|-----------------------|
| Mackinaw..... 0.0 | Grand Haven... 251.8 |
| Petosky..... 38.3 | Grand Rapids.. 283.0 |
| Travers City... 108.9 | Kalamazoo..... 331.6 |
| Manistee..... 141.4 | South Bend..... 400.7 |
| Muskegon..... 238.8 | |

South Bend-Indianapolis, Ind.

| Miles | Miles |
|--------------------|-----------------------|
| South Bend... 0.0 | Logansport..... 65.7 |
| Plymouth..... 23.4 | Indianapolis... 135.9 |

Atlanta-Macon, Ga.

| Miles | Miles |
|-------------------|-------------------|
| Atlanta..... 0.0 | Forsyth..... 69.3 |
| Griffin..... 39.8 | Macon..... 94.5 |

Macon-Jacksonville, Fla.

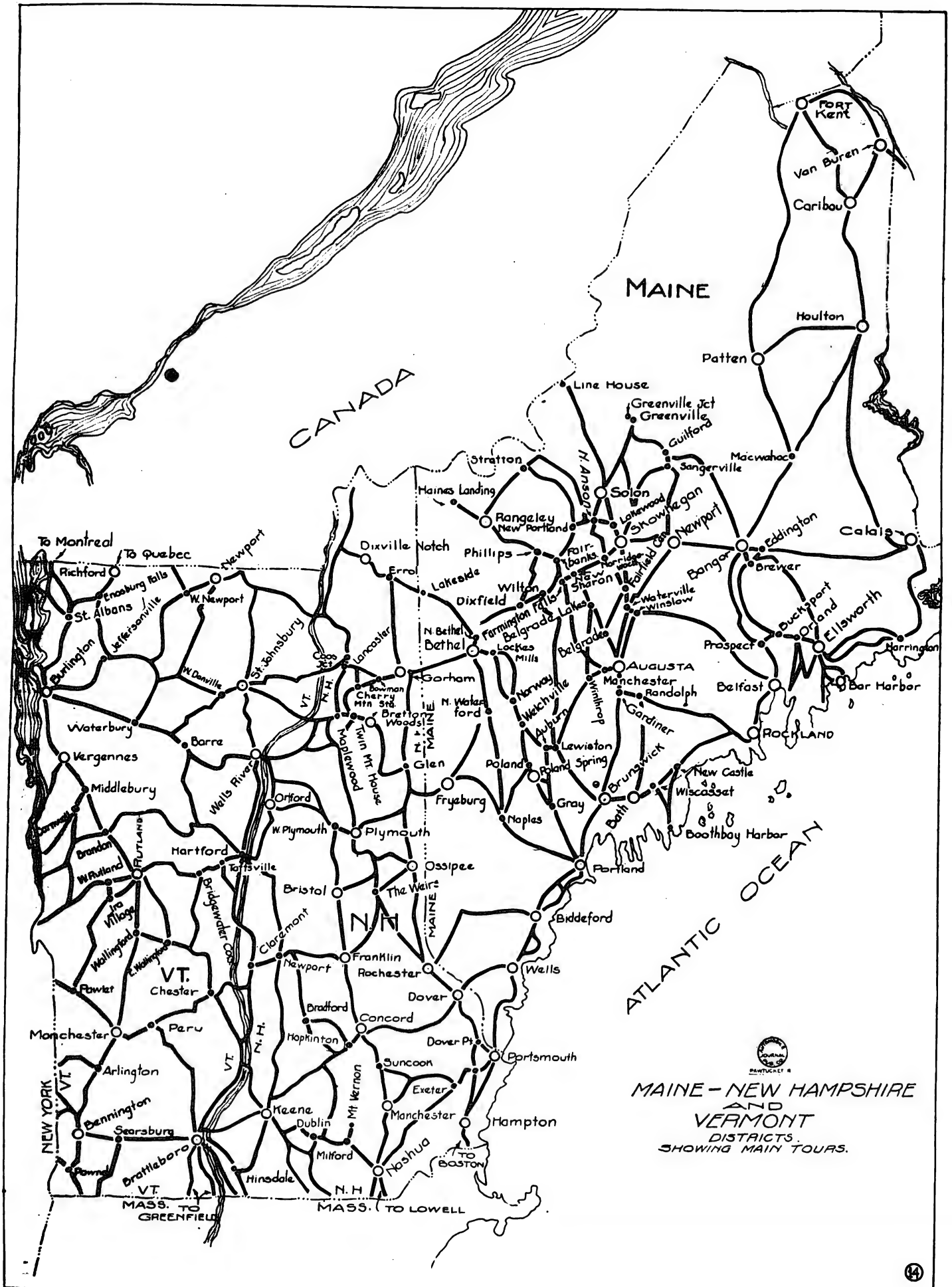
| Miles | Miles |
|----------------------|-----------------------|
| Macon..... 0.0 | Waycross..... 174.3 |
| Perry..... 28.2 | Jacksonville... 254.8 |
| Fitzgerald..... 95.7 | |

Jacksonville-Miami, Fla.

| Miles | Miles |
|-----------------------|------------------------|
| Jacksonville... 0.0 | Melbourne..... 203.3 |
| St. Augustine.. 39.8 | Fort Pierce..... 252.1 |
| Hastings..... 58.3 | W. P'm Beach.. 311.0 |
| Dayton..... 113.2 | F. Lauderdale.. 354.0 |
| Titusville..... 161.9 | Miami..... 381.9 |

Miami-Jupiter, Fla.

| Miles | Miles |
|----------------------|---------------------|
| Miami..... 0.0 | W. P'm Beach.. 69.1 |
| F. Lauderdale.. 26.1 | Jupiter..... 85.9 |



NEW ENGLAND ROUTES

NEW YORK TO BOSTON VIA NEW HAVEN.

New York-New Haven.

| Miles | Miles |
|----------------------|----------------------|
| New York..... 0.0 | Norwalk..... 43.7 |
| New Rochelle... 18.0 | Westport..... 47.0 |
| Larchmont..... 19.8 | Southport..... 51.3 |
| Mamaroneck... 21.4 | Fairfield..... 52.8 |
| Rye..... 25.2 | Bridgeport..... 57.5 |
| Portchester... 26.9 | Stratford..... 61.1 |
| Greenwich..... 29.8 | Milford..... 65.7 |
| Stamford..... 35.0 | New Haven.... 75.0 |
| Darien..... 39.2 | |

| | |
|----------------------|----------------------|
| North Attleboro 12.3 | Dedham..... 34.2 |
| Plainville..... 14.0 | Forest Hills... 38.7 |
| Wampum..... 17.4 | Boston..... 44.2 |
| Wrentham..... 18.9 | |

NEW HAVEN TO BOSTON VIA SPRINGFIELD.

New Haven-Hartford.

| Miles | Miles |
|---------------------|--------------------|
| New Haven..... 0.0 | Meriden..... 19.9 |
| North Haven... 8.1 | Berlin..... 26.1 |
| Wallingford... 13.5 | Hartford..... 37.1 |

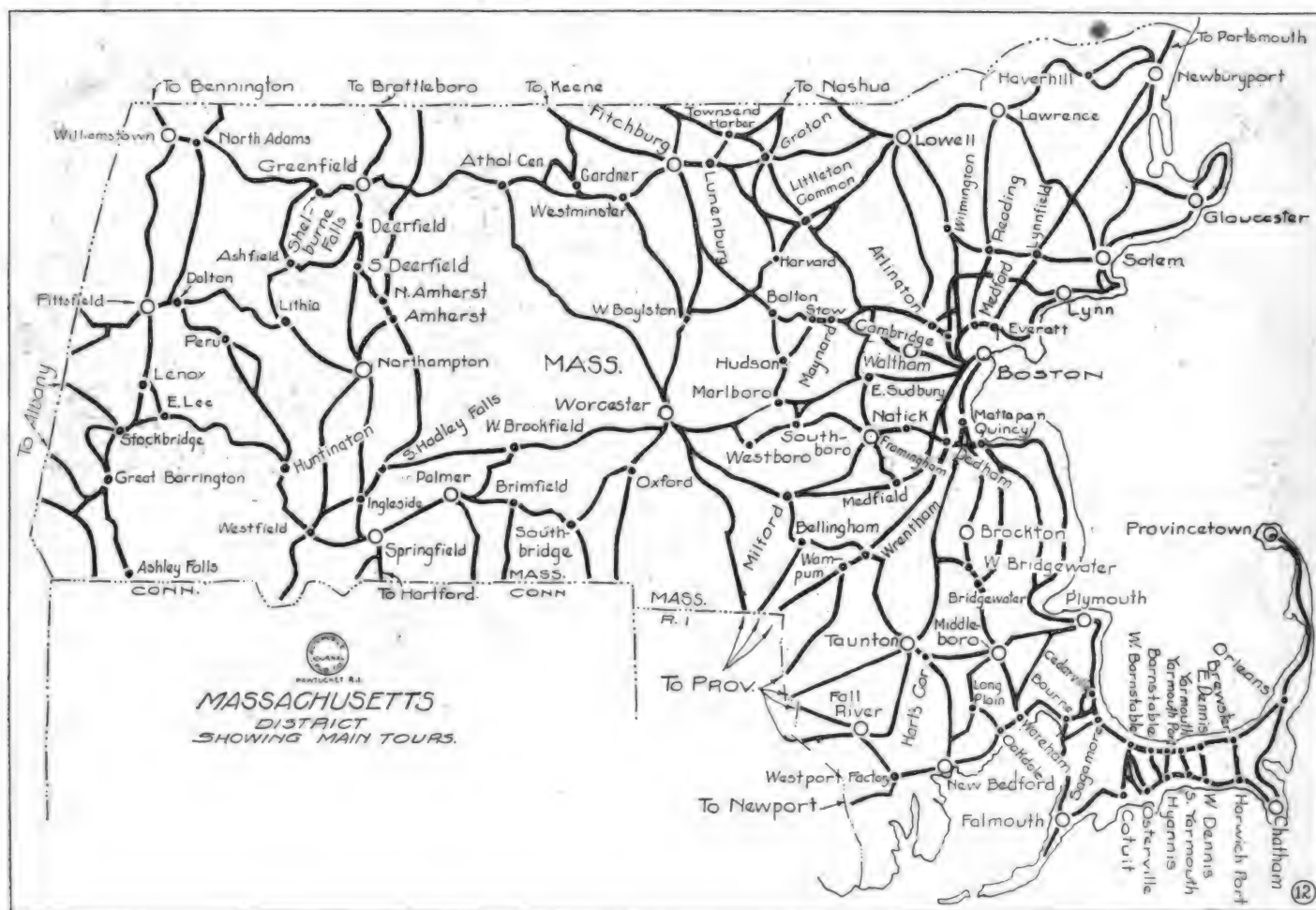
NEW YORK TO DANBURY AND POINTS IN CONNECTICUT.

New York-Danbury.

| Miles | Miles |
|----------------------|----------------------|
| New York..... 0.0 | Cross River.... 44.3 |
| White Plains... 23.4 | South Salem... 48.5 |
| Armonk..... 31.3 | Ridgefield..... 52.5 |
| Bedford..... 39.3 | Danbury..... 62.0 |

Danbury-New Haven.

| Miles | Miles |
|--------------------|--------------------|
| Danbury..... 0.0 | Huntington... 21.0 |
| Bethel..... 3.4 | Shelton..... 24.6 |
| Dodgingtown... 6.5 | Derby..... 24.9 |



New Haven-New London.

| Miles | Miles |
|--------------------|--------------------|
| East Haven.... 4.5 | Westbrook.... 20.2 |
| Brandford.... 7.5 | Saybrook.... 33.4 |
| Gilford..... 16.1 | Lyme..... 36.7 |
| Madison..... 21.0 | Flanders..... 46.0 |
| Clinton..... 24.9 | New London... 52.8 |

New London-Providence.

| Miles | Miles |
|---------------------|----------------------|
| New London... 0.0 | Wakefield.... 36.6 |
| Groton..... 1.1 | Narragansett... 41.3 |
| Mystic..... 7.7 | Wickford..... 52.9 |
| Stonington... 10.7 | East Greenwich 60.2 |
| Westerly.... 17.0 | Apponaug.... 62.7 |
| Charlestown... 28.8 | Providence.... 72.7 |

Providence-Boston.

| Miles | Miles |
|--------------------|-------------------|
| Providence.... 0.0 | Walpole..... 26.7 |
| Pawtucket.... 4.3 | Norwood..... 30.0 |

Hartford-Springfield.

| Miles | Miles |
|---------------------|----------------------|
| Hartford..... 0.0 | Thompsonville.. 18.6 |
| East Hartford.. 1.9 | Long Meadow... 22.3 |
| Warehouse Pt.. 13.4 | Springfield... 24.7 |
| Enfield..... 17.5 | |

Springfield-Worcester.

| Miles | Miles |
|----------------------|-----------------------|
| Springfield... 0.0 | Brookfield.... 32.9 |
| N. Wilbraham.. 9.6 | E. Brookfield... 36.3 |
| Palmer..... 15.7 | Spencer..... 39.4 |
| West Warren... 24.0 | Leicester..... 44.3 |
| Warren..... 26.5 | Worcester..... 50.5 |
| W. Brookfield.. 30.2 | |

Worcester-Boston.

| Miles | Miles |
|--------------------|----------------------|
| Worcester..... 0.0 | South Sudbury.. 23.0 |
| Shrewsbury... 5.5 | Wayland..... 26.2 |
| Northboro... 10.0 | Weston..... 29.7 |
| Marlboro.... 15.8 | Boston..... 43.5 |

| | |
|-------------------|--------------------|
| Stepney..... 14.7 | New Haven.... 34.5 |
|-------------------|--------------------|

Danbury-Bridgeport.

| Miles | Miles |
|------------------|---------------------|
| Danbury..... 0.0 | Red Ridge..... 10.4 |
| Bethel..... 3.4 | Easton..... 16.3 |
| Redding..... 8.5 | Bridgeport.... 25.5 |

Danbury-Waterbury.

| Miles | Miles |
|--------------------|---------------------|
| Danbury..... 0.0 | Southbury.... 17.0 |
| Newtown..... 9.2 | Middlebury.... 25.9 |
| Sandy Hook... 10.7 | Waterbury.... 31.6 |

Danbury-Norwalk.

| Miles | Miles |
|---------------------|-------------------|
| Danbury..... 0.0 | Norwalk..... 22.1 |
| Branchville... 10.5 | |

Danbury-Stamford.

| Miles | Miles |
|--------------------|--------------------|
| Danbury..... 0.0 | Glenbrook.... 26.6 |
| Lewisboro... 13.8 | Stamford..... 28.5 |
| New Canaan... 20.7 | |

Waterbury-Hartford.

| Miles | Miles |
|-----------------------|-----------------------|
| Waterbury..... 0.0 | Plainville 16.7 |
| Marion..... 0.7 | Farmington 21.3 |
| Milldale..... 8.1 | Hartford 30.4 |
| Southington..... 11.9 | |

**NEW YORK TO WHITE MOUNTAINS
VIA GREENFIELD.****New York-Pittsfield.**

| Miles | Miles |
|--------------------------|---------------------------|
| New York..... 0.0 | Wassau 90.0 |
| Yonkers..... 14.0 | Amenia 93.5 |
| Dobbs Ferry..... 19.2 | Millerton 102.5 |
| Tarrytown..... 24.2 | Lakeville 108.4 |
| Briarcliff..... 30.9 | Salisbury 107.9 |
| Yorktown H'ths..... 41.6 | S. Egremont..... 121.4 |
| Carmel..... 57.4 | Great Bar'gton..... 125.0 |
| Patterson..... 65.8 | Stockbridge..... 132.4 |
| Pawling..... 70.5 | Lenox 138.3 |
| South Dover..... 78.3 | Pittsfield 145.0 |

| | |
|---------------------|---------------------|
| Orford..... 22.3 | Bethlehem 67.2 |
| Piermont..... 28.3 | White Mtn. |
| Haverhill..... 33.5 | (Twin Mtn. H. 75.5) |

**NEW YORK TO WHITE MOUNTAINS
VIA BURLINGTON.****Pittsfield-Rutland.**

| Miles | Miles |
|------------------------|-------------------------|
| Pittsfield..... 0.0 | Manchester 58.5 |
| Lanesboro..... 5.3 | Manchester C. 59.8 |
| Williamstown..... 21.5 | E. Dorset..... 65.1 |
| Bennington..... 35.5 | Danby 72.8 |
| Shaftsbury..... 43.2 | Wallingford..... 82.1 |
| Arlington..... 50.4 | Rutland 92.5 |

Pittsfield-Keene.

| Miles | Miles |
|-----------------------|-------------------------|
| Pittsfield..... 0.0 | Stamford 28.5 |
| Cheshire..... 10.7 | Heartwell, V. 34.1 |
| Adams..... 15.8 | Searsburg 40.3 |
| North Adams..... 22.0 | Keene 86.0 |

OPTIONAL ROUTES.**Rutland-White River Junction.**

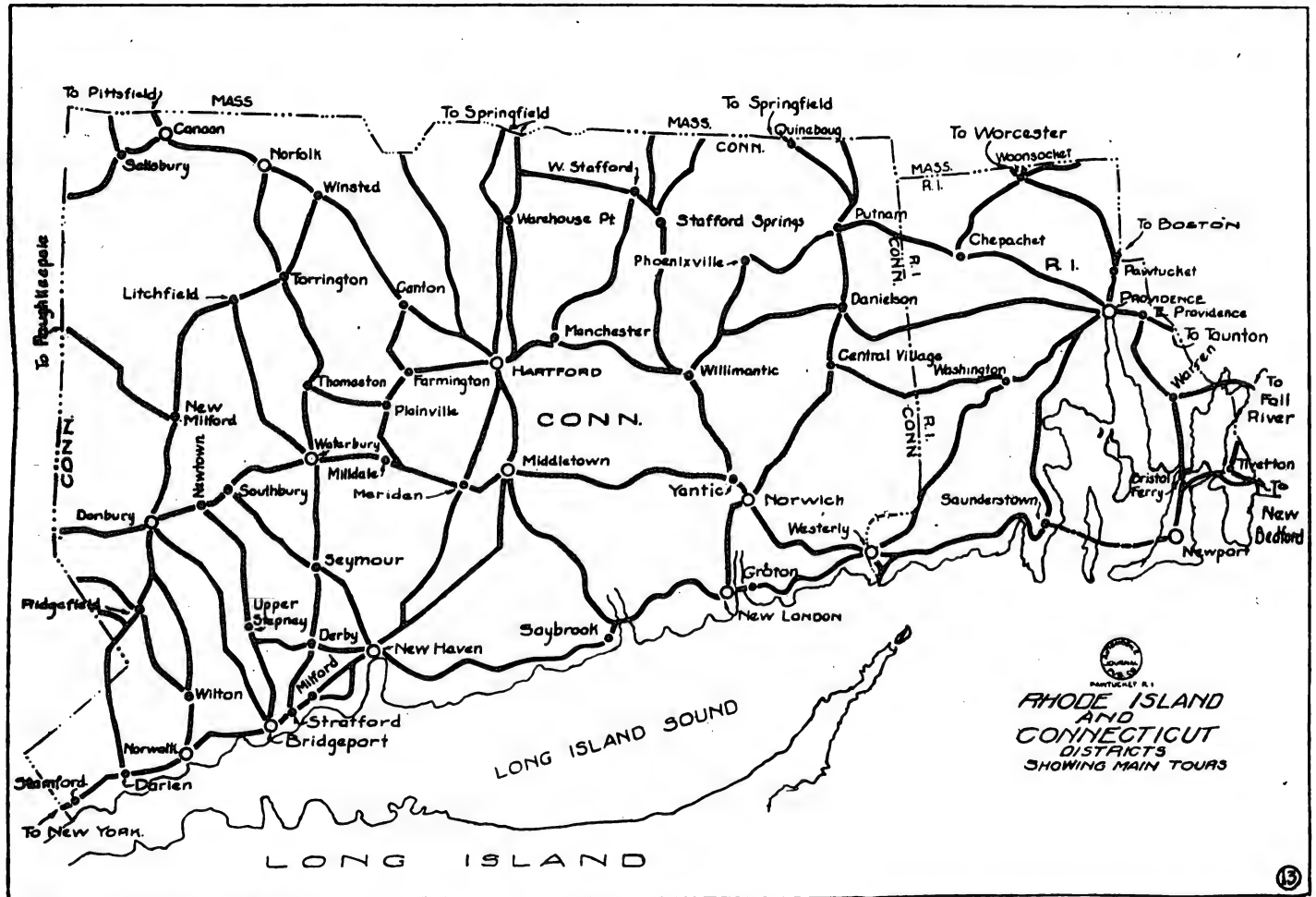
| Miles | Miles |
|--------------------------|--------------------------|
| Rutland..... 0.0 | Bridgewater 25.3 |
| Mendon..... 4.2 | Woodstock 31.7 |
| Sherburne..... 13.4 | Taftsville 35.0 |
| W. Bridgewater..... 17.7 | Quechee 38.6 |
| Bridge'r Cra. 23.7 | W. R. Junction..... 45.0 |

Rutland-Lake George.

| Miles | Miles |
|--------------------------|------------------------|
| Rutland..... 0.0 | Comstock 33.4 |
| W. Rutland..... 3.7 | Fort Ann..... 37.4 |
| Castleton..... 11.0 | Hudson Falls..... 44.4 |
| Castleton Cra. 12.6 | Glenns Falls..... 50.0 |
| Fair Haven..... 18.0 | Lake George..... 59.0 |
| White Hall..... 26.2 | |

BOSTON TO WHITE MOUNTAINS.**Boston-Concord.**

| Miles | Miles |
|-----------------|-------------------|
| Boston..... 0.0 | Nashua 43.5 |

**Pittsfield-Greenfield.**

| Miles | Miles |
|----------------------|------------------------|
| Pittsfield..... 0.0 | Goshen 30.5 |
| Dalton..... 0.4 | Williamaburg..... 36.3 |
| Windsor..... 12.5 | Haydenville..... 38.6 |
| Cummington..... 24.2 | Northampton..... 44.5 |
| Lithia..... 28.0 | Greenfield 64.5 |

Greenfield-White River Junction.

| Miles | Miles |
|-------------------------|--------------------------|
| Greenfield..... 0.0 | Charlestown..... 51.5 |
| Barnardston..... 6.0 | Claremont 62.5 |
| Gulford..... 17.6 | W. Claremont..... 65.2 |
| Brattleboro..... 20.5 | Ascutneyville..... 67.4 |
| Putney..... 30.0 | Windsor 72.6 |
| Westminster..... 38.6 | Hartland 77.4 |
| Bellows Falls..... 44.0 | W. River June. 87.5 |

White River Junction-White Mountains.

| Miles | Miles |
|------------------------|-----------------------|
| W. River June..... 0.0 | Woodsville 44.7 |
| W. Lebanon..... 0.6 | Bath 45.9 |
| Hanover..... 4.5 | Lisbon 51.6 |
| Lyme..... 15.2 | Littleton 62.3 |

Pittsfield-Burlington.

| Miles | Miles |
|---------------------------|--------------------------|
| Pittsfield..... 0.0 | Hampton 89.2 |
| Manchester..... 58.5 | Fair Haven..... 94.0 |
| Man. Cen. P. O. 59.8 | Castleton Cor. 97.0 |
| Dorset..... 66.0 | Hubbardston..... 104.1 |
| E. Rupert..... 68.0 | Sudbury 110.4 |
| Pawlet..... 74.5 | Cornwall 122.8 |
| N. Pawlet..... 78.0 | Middlebury 126.5 |
| Wells..... 80.4 | Burlington 161.5 |
| Poultney..... 88.2 | |

Burlington-White Mountains.

| Miles | Miles |
|-------------------------|-------------------------|
| Burlington..... 0.0 | W. Danville..... 65.3 |
| Williston..... 7.8 | Danville 68.2 |
| Richmond..... 12.7 | St. Johnsbury..... 75.5 |
| Waterbury..... 26.5 | Waterford 88.3 |
| Montpelier..... 38.5 | Littleton 93.8 |
| E. Montpelier..... 45.5 | Bethlehem 98.9 |
| Plainfield..... 48.6 | White Mtn. |
| Marshfield..... 55.1 | (Twin M. H.) 107.0 |
| E. Cabot..... 62.0 | |

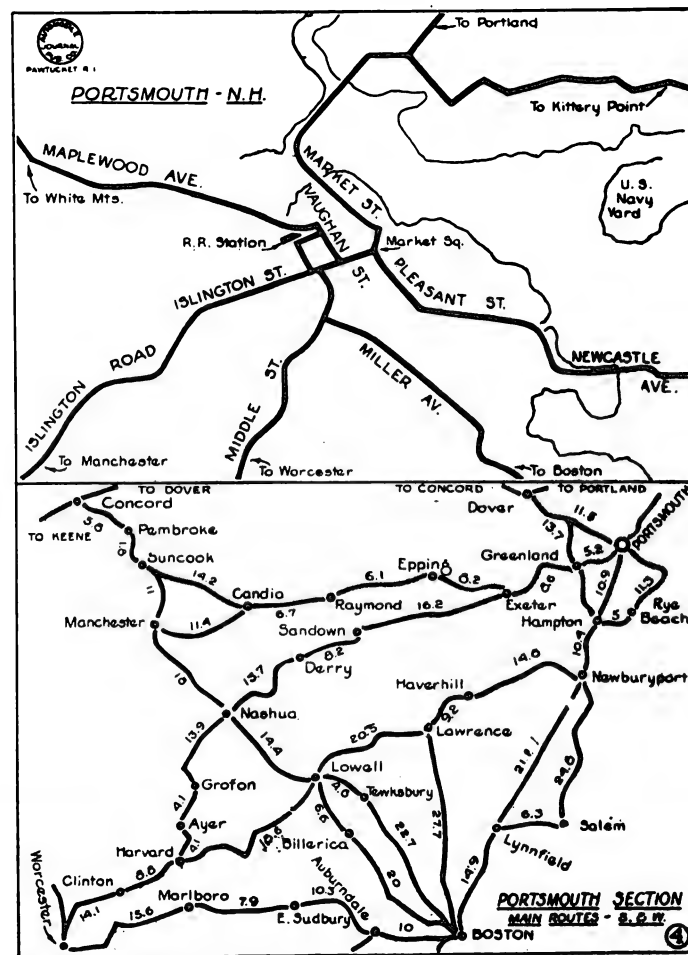
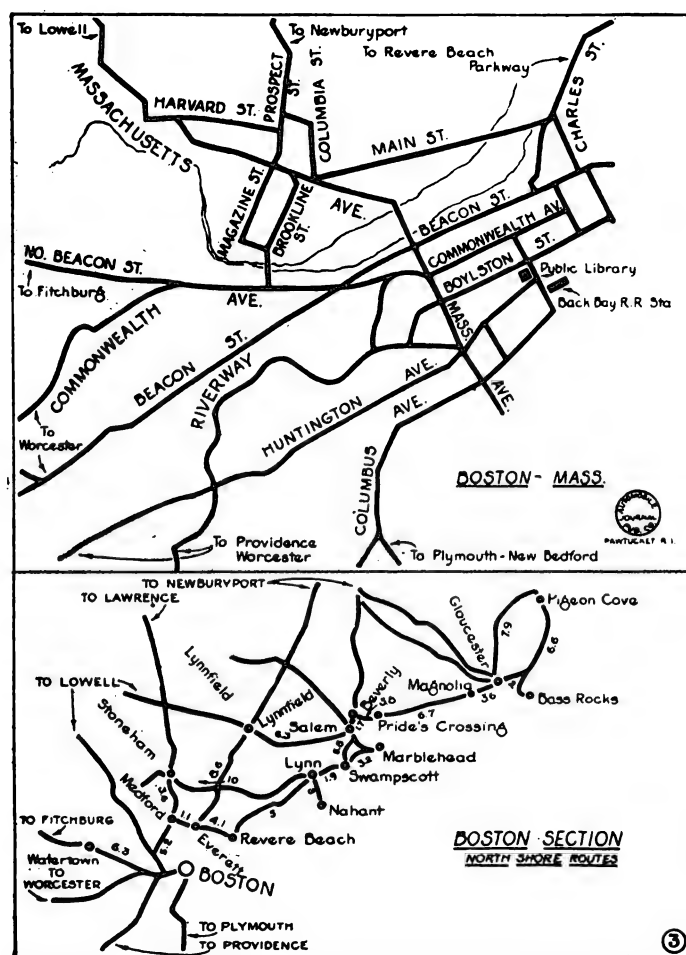
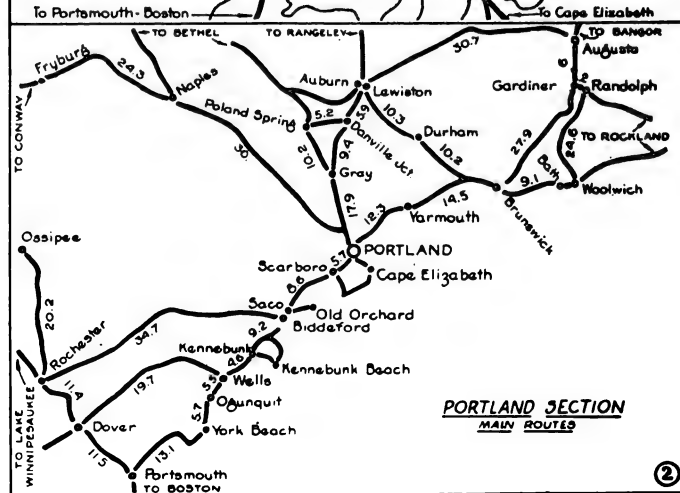
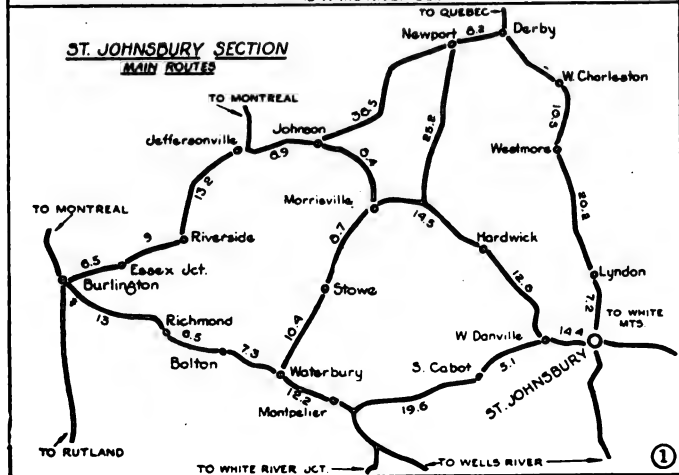
| | |
|-----------------------|-----------------------|
| Winchester..... 11.5 | Reeds Ferry..... 53.0 |
| Woburn..... 13.7 | Manchester 62.0 |
| Williamston..... 18.9 | Suncook 73.0 |
| Tewksbury..... 24.7 | Pembroke 74.6 |
| Lowell..... 29.5 | Concord 80.5 |
| Tyngsboro..... 37.1 | |

Concord-White Mountains.

| Miles | Miles |
|----------------------|-------------------------|
| Concord..... 0.0 | Holderness 50.3 |
| Penacook..... 6.1 | Ashland 54.3 |
| Boscawen..... 8.8 | Plymouth 60.0 |
| Franklin..... 18.5 | Woodstock 77.0 |
| Tilton..... 22.0 | N. Woodstock..... 81.0 |
| Winnisquam..... 28.5 | Flue House..... 84.0 |
| Laconia..... 31.3 | Profile House..... 91.0 |
| Lakeport..... 33.0 | White Mtn. |
| Wiers..... 37.5 | (Twin M. H.) 104.5 |
| Meredith..... 42.4 | |

Boston-Portsmouth.

| Miles | Miles |
|------------------------|-----------------------|
| Boston..... 0.0 | Rawley 38.3 |
| Revere Beach..... 11.1 | Newbury 42.5 |
| Lynn..... 15.0 | Newburyport..... 46.0 |



| | | | |
|---------------|------|--------------------|------|
| Salem..... | 21.5 | Salisbury..... | 48.6 |
| Beverly..... | 23.1 | Smithtown..... | 51.2 |
| Wenham..... | 28.0 | Hampton Falls..... | 54.2 |
| Hamilton..... | 30.0 | Rye Beach..... | 62.2 |
| Ipswich..... | 34.3 | Portsmouth..... | 73.5 |

Portsmouth-White Mountains.

| | Miles | | Miles |
|-----------------|-------|----------------|-------|
| Portsmouth... | 0.0 | Conway..... | 80.5 |
| Dover..... | 11.5 | N. Conway..... | 86.0 |
| Somersworth... | 16.3 | Intervale..... | 87.5 |
| Rochester..... | 23.0 | Glen..... | 91.5 |
| Milton..... | 31.0 | Bartlett..... | 98.0 |
| Union..... | 37.0 | Bemis..... | 104.0 |
| Sanbornville... | 42.0 | Crawfd House | 112.6 |
| Wakefield..... | 43.0 | Bretton Woods | 115.9 |
| Ossipee..... | 53.0 | Fabyana..... | 116.5 |
| W. Ossipee.... | 64.5 | White Mts. | |
| Chocorua..... | 68.5 | (Twin M. H.) | 121.0 |

PORTSMOUTH TO WHITE MOUNTAINS VIA POLAND SPRINGS.**Portsmouth-Portland.**

| | Miles | | Miles |
|--------------------|-------|--------------------|-------|
| Portsmouth | 0.0 | Ogunquit | 19.0 |
| Kittery | 1.1 | Wells | 24.5 |
| York Cor. | 7.6 | Kennebunk | 29.0 |
| York | 8.5 | Biddeford | 38.5 |
| York Harbor . . . | 9.5 | Saco | 39.5 |
| York Beach . . . | 13.2 | Dunstan | 45.1 |
| Cape Neddick . . | 15.0 | Portland | 54.0 |

Portland-Poland Springs and White Mountains.

| Miles | | Miles | |
|----------------------|------|---------------------|-------|
| Portland | 0.0 | Redstone | 78.3 |
| Gray | 17.0 | N. Conway | 81.5 |
| Dry Mills | 19.6 | Intervale | 83.4 |
| Poland Springs | 27.5 | Glen | 87.3 |
| Poland | 30.5 | Bartlett | 93.5 |
| Webbs Mills | 39.1 | Bemis | 99.5 |
| Cooks Mills | 43.0 | Crawf'd House | 108.1 |
| Naples | 46.7 | Bretton Woods | 111.4 |
| Bridgton | 55.1 | Fabyana | 112.0 |
| E. Fryeburg | 64.9 | White Mts. | |
| Fryeburg | 70.9 | (Twin M. H.) | 116.5 |
| Conway | 75.6 | | |

PORTLAND TO FT. KENT VIA BANGOR.**Portland-Rockland.**

| | Miles | | Miles |
|------------------|-------|--------------------|-------|
| Portland | 0.0 | Newcastle | 54.1 |
| Yarmouth | 11.9 | Damariscotta | 54.5 |
| Freeport | 11.7 | Waldoboro | 64.3 |
| Brunswick | 28.5 | West Warren | 71.3 |
| Woolwich | 35.7 | Thomaston | 76.7 |
| Wiscasset | 45.0 | Rockland | 81.0 |
| N. Edgcomb | 46.7 | | |

Rockland-Bangor.

| | Miles | | Miles |
|----------------|-------|-----------------|-------|
| Rockland..... | 0.0 | Stockton | 37.2 |
| Rockport..... | 6.4 | Prospect | 41.7 |
| Camden | 8.0 | Frankfort | 45.7 |
| Northport..... | 19.0 | Hampden | 55.8 |
| Belfast..... | 27.0 | Bangor | 62.0 |
| Searsport..... | 33.0 | | |

Bangor-Houlton.

| Miles | | Miles | |
|-------------------|------|------------------|-------|
| Bangor..... | 0.0 | Lincoln..... | 49.0 |
| Orono..... | 8.0 | Matawamkeag..... | 63.0 |
| Oldtown..... | 13.0 | Macwahoc..... | 72.5 |
| Passadumkeag..... | 32.0 | Hayneville..... | 92.5 |
| West Enfield..... | 37.0 | Houlton..... | 117.0 |

Houlton-Fort Kent.

| Houlton | | Fort Kent | |
|-------------------|-------|-----------------|-------|
| | Miles | | Miles |
| Houlton | 0.0 | North Lenton... | 60.5 |
| Middleton | 7.3 | Van Buren..... | 76.2 |
| Monticello..... | 12.8 | Grand Isle..... | 91.7 |
| Blaine..... | 26.5 | Madawaska ... | 100.5 |
| Presque Isle..... | 41.5 | Fort Kent..... | 120.5 |
| Carribou..... | 54.2 | | |

OPTIONAL TRIPS.**Bangor-Skowhegan.**

| | Miles | | Miles |
|-------------|-------|----------------|-------|
| Bangor..... | 0.0 | Newport | 26.2 |
| Heron..... | 7.5 | Palmyra..... | 30.6 |
| Carmel..... | 14.7 | Canaan..... | 42.5 |
| Etna..... | 18.0 | Skowhegan..... | 51.0 |

Skowhegan-Rangeley.

| Miles | | Miles | |
|---------------------|-----|-----------------|------|
| Skowhegan.... | 0.0 | Dead River.... | 43.0 |
| Lakewood..... | 5.7 | Flagstaff | 52.1 |
| North Anson... 12.5 | | Stratton | 63.1 |

| | | | |
|--------------------|------|---------------|------|
| N. New Port'd..... | 21.1 | Rangeley..... | 83.0 |
| Lexington..... | 29.5 | | |

Bar Harbor-Portland.

| | Miles | | Miles |
|--------------------|-------|-----------------|-------|
| Bar Harbor.... | 0.0 | Orland | 37.0 |
| Ellsworth.... | 19.8 | Bucksport | 39.7 |
| East Orland.... | 33.3 | Prospect | 40.6 |
| (Via Bangor Route) | | | |
| Portland..... | 166.0 | | |

Portland-Augusta.

| Miles | | Miles | |
|---------------------|------|-----------------|------|
| Portland..... | 0.0 | Lewiston | 33.6 |
| Gray..... | 17.0 | Greene..... | 42.0 |
| Up. Gloucester..... | 24.5 | Winthrop | 54.5 |
| Danville Junc. | 27.7 | Manchester..... | 60.6 |
| Auburn..... | 33.4 | Augusta..... | 65.0 |

Portland-Rangeley.

| | Miles | | Miles |
|---------------------|-------|----------------------|-------|
| Portland..... | 0.0 | Howes Corner..... | 50.1 |
| Gray..... | 17.0 | Norlands..... | 55.1 |
| Up. Gloucester..... | 24.5 | Livermore Falls..... | 60.2 |
| Danville Junc..... | 27.7 | North Jay..... | 66.6 |
| Auburn..... | 33.4 | Wilton..... | 69.7 |
| E. Auburn..... | 36.5 | Farmington.... | 77.2 |
| (Via Augusta Route) | | | |
| Rangeley..... | 119.0 | | |

MOOSEHEAD ROUTE VIA AUGUSTA.**Augusta-Moosehead.**

| Miles | | Miles | |
|-----------------------|------|------------------|------|
| Augusta..... | 0.0 | Athens | 49.0 |
| Vassalboro..... | 11.7 | Brighton | 57.5 |
| Waterville..... | 19.5 | Kingsbury | 63.4 |
| Fairfield Centre | 23.0 | Greenville..... | 90.8 |
| Skowhegan..... | 36.0 | Greenville Junc. | 92.5 |
| (Boats to Moosehead.) | | | |

CAPE TRIPS FROM BOSTON.**Boston-Falmouth.**

| | Miles | | Miles |
|----------------------|-------|---------------------|-------|
| Boston | 0.0 | Tremont | 48.8 |
| Randolph | 15.8 | Wareham | 52.0 |
| Avon | 18.2 | Onset | 56.3 |
| Brockton | 22.0 | Bourne | 60.5 |
| W. Bridgewater | 26.5 | Monument B'ch | 62.4 |
| Bridgewater | 29.3 | West Falmouth | 71.5 |
| Middleboro | 37.5 | Falmouth | 75.5 |

Falmouth-Chatham.

| | Miles | | Miles |
|-----------------|-------|-----------------|-------|
| Falmouth..... | 0.0 | Centreville ... | 21.2 |
| Waquoit..... | 6.6 | Hyannis | 25.1 |
| Marshpee..... | 11.7 | S. Yarmouth... | 30.6 |
| Santuit..... | 13.6 | S. Harwich..... | 38.3 |
| Marston Mills.. | 15.7 | Chatham | 43.5 |

Chatham-Provincetown.

| Miles | | Miles | |
|--------------|------|-------------------|------|
| Chatham..... | 0.0 | Wellfleet | 22.0 |
| Orleans..... | 9.5 | Truro | 26.7 |
| Eastham..... | 13.0 | Provincetown..... | 36.5 |

Provincetown-Providence.

| | Miles | | Miles |
|------------------------|-------|---------------------------|-------|
| Provincetown | 0.0 | Onset | 69.6 |
| Truro | 9.7 | Wareham | 74.0 |
| Wellfleet | 14.5 | Marion | 79.3 |
| Eastham | 23.4 | Mattapoisett | 84.0 |
| Orleans | 27.0 | Fairhaven | 90.0 |
| Brewster | 32.6 | New Bedford | 91.0 |
| Dennis | 39.2 | Westport Fact'y | 97.5 |
| Yarmouth | 42.5 | Fall River | 102.5 |
| Barnstable | 46.5 | Swansea | 109.1 |
| Sandwich | 58.8 | Seekonk | 119.4 |
| W. Sagamore | 61.0 | Providence | 124.0 |

Boston-Plymouth.

| Miles | | Miles | |
|------------------|------|-----------------|------|
| Boston..... | 0.0 | Greenbush | 29.6 |
| Forest Hills.... | 5.7 | Marshfield Cen. | 35.3 |
| Quincy..... | 13.0 | Marshfield | 37.7 |
| Hingham..... | 17.3 | Kingston..... | 45.9 |
| Cohasset..... | 23.9 | Plymouth..... | 50.5 |

Boston-Newport, R. I.

| | Miles | | Miles |
|-------------------|-------|-----------------|-------|
| Boston..... | 0.0 | Dighton..... | 41.8 |
| Forest Hills..... | 5.7 | Somerset..... | 45.1 |
| Punkapoag.... | 14.0 | Fall River..... | 50.8 |
| Stoughton..... | 19.1 | Tiverton..... | 57.3 |
| Taunton..... | 26.4 | Newport..... | 69.5 |

Providence-Newport, R. I.

| | Miles | | Miles |
|-----------------|-------|------------------|-------|
| Providence..... | 0.0 | Bristol Ferry... | 16.7 |
| Warren..... | 12.3 | Newport | 28.5 |

Boston-Gloucester, Mass.

| Miles | | Miles | |
|-------------------|------|-----------------------|------|
| Boston | 0.0 | Salem | 22.9 |
| Cambridge..... | 1.6 | Beverly..... | 25.5 |
| Somerville..... | 2.6 | Pride's Crossing..... | 28.8 |
| Everett..... | 5.4 | Beverly Farms..... | 29.5 |
| Revere Beach..... | 10.3 | Manchester..... | 32.1 |
| Lynn..... | 15.4 | Magnolia..... | 35.5 |
| Swampscott..... | 17.2 | Gloucester..... | 39.3 |

Around Cape Ann.

| | Miles | | Miles |
|-----------------|-------|-----------------|-------|
| Glou'ter, Mass. | 0.0 | Annisquam..... | 11.1 |
| Rockport..... | 4.2 | Riverdale | 12.3 |
| Pigeon Cove... | 5.9 | Gloucester | 13.8 |
| Ocean View... | 7.6 | | |

Boston-Nantasket Beach, Mass.

| | Miles | | Miles |
|--------------------|-------|-----------------------|-------|
| Boston | 0.0 | Quincy | 14.5 |
| Brookline | 3.2 | North Weymouth | 18.4 |
| Forest Hills | 5.8 | North Cohasset | 23.3 |
| Ashmont | 9.7 | Nantasket Beach | 24.3 |

Boston-Mt. Wachusett, Mass.

| | Miles | | Miles |
|--------------------|-------|---------------------|-------|
| Boston | 0.0 | Stow | 24.7 |
| Allston | 3.1 | Bolton | 30.5 |
| Watertown | 5.7 | Clinton | 35.7 |
| Beaver Brook | 8.1 | Sterling | 40.6 |
| Waltham | 9.8 | West Sterling | 44.4 |
| Kendal Green | 11.1 | Princeton | 47.7 |
| Maynard | 21.5 | Mt. Wachusett | 52.7 |

Providence, R. I.-Buzzard's Bay, Mass.

| | Miles | | Miles |
|--------------------|-------|-------------------|-------|
| Providence | 0.0 | Tremont | 39.7 |
| Reh'both, Mass. . | 3.8 | Wareham | 44.6 |
| Taunton | 18.0 | East Wareham . . | 46.9 |
| Middleboro | 29.3 | Buzzard's Bay . . | 50.2 |
| S. Middleboro . . | 35.9 | | |

MOHAWK TRAIL FROM BOSTON.**Boston-Greenfield..**

| | Miles | | Miles |
|------------------------|-------|---------------------|-------|
| Boston | 0.0 | Westminster .. | 54.3 |
| Cambridge | 0.8 | Gardner | 58.8 |
| Lexington | 11.4 | Otter River | 63.4 |
| Concord | 11.5 | Baldwinville | 64.6 |
| North Acton | 25.0 | Athol | 74.7 |
| Littleton | 27.8 | Orange | 79.3 |
| Littleton Center | 28.6 | Erving | 84.3 |
| Ayer | 34.7 | Millers Falls | 90.6 |
| Lunenburg | 43.0 | Turners Falls | 94.8 |
| Fitchburg | 47.0 | Greenfield | 98.0 |

Greenfield-Albany.

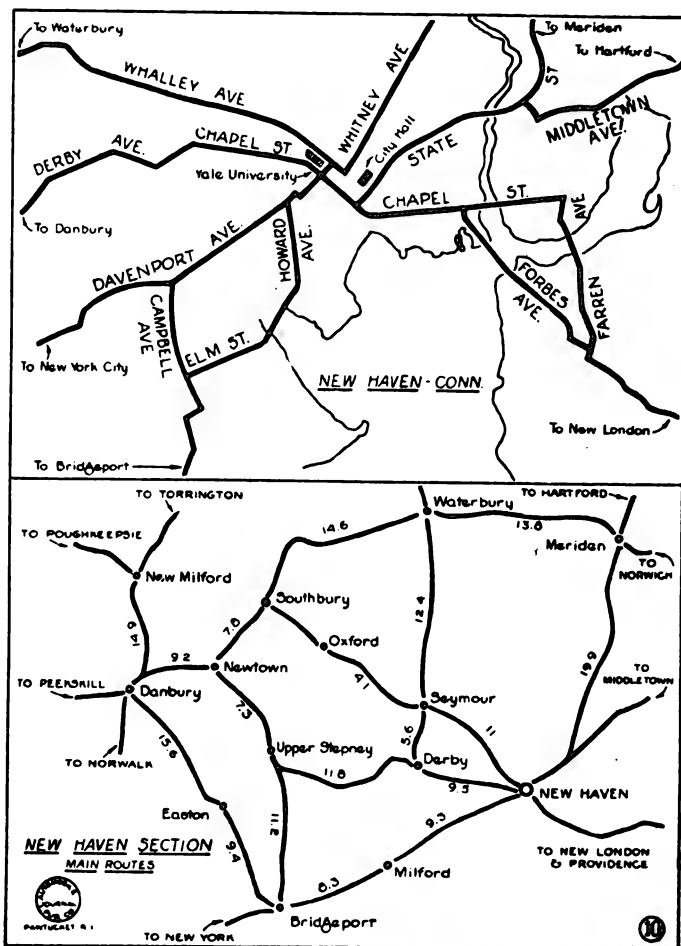
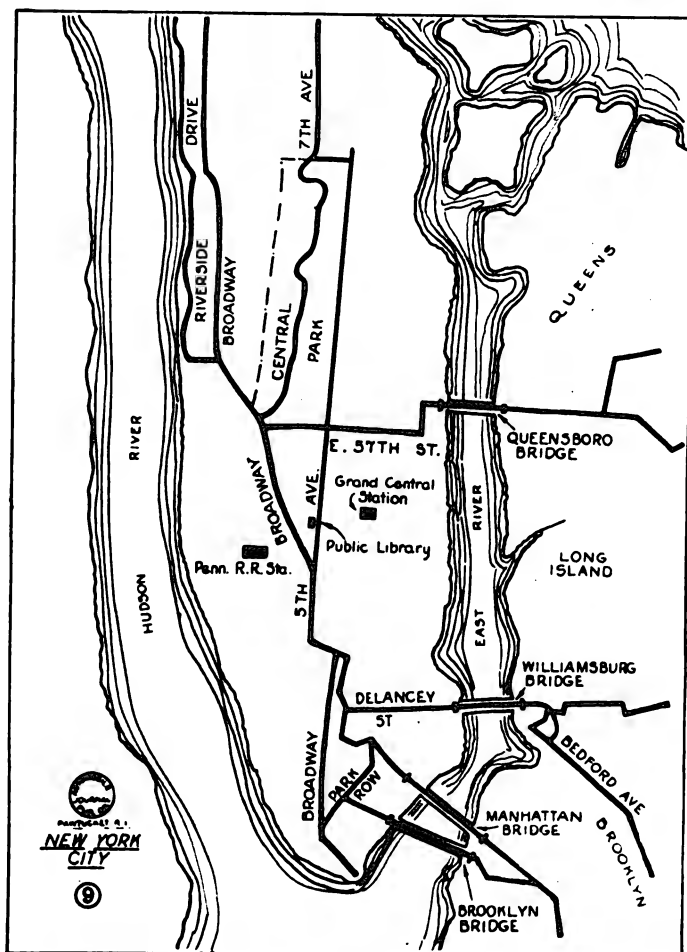
| Miles | | Miles | |
|----------------------|------|--------------------|------|
| Greenfield..... | 0.0 | N. Bownal..... | 49.8 |
| Shelburne..... | 5.4 | N. Petersburg..... | 53.5 |
| Shelburne Falls..... | 9.0 | Petersburg..... | 59.0 |
| Charlemont..... | 17.5 | Brunswick Cor..... | 74.7 |
| North Adams..... | 36.5 | Troy..... | 79.5 |
| Williamstown..... | 41.5 | Albany..... | 85.0 |
| Bownal..... | 46.9 | | |

ROUTES TO CANADA.**Burlington-Montreal.**

| | Miles | | Miles |
|---------------------|-------|-------------------|-------|
| Burlington..... | 0.0 | Rouses Point... | 48.5 |
| Winoaki..... | 2.1 | Lacolle..... | 56.8 |
| Colchester..... | 6.2 | Naperville..... | 64.8 |
| South Hero..... | 18.1 | Douglas Corner... | 67.1 |
| Grand Isle..... | 24.5 | St. Jacques..... | 72.8 |
| North Hero..... | 31.1 | Laprairie..... | 85.1 |
| Alburg Passage..... | 36.7 | Montreal..... | 94.0 |
| Alburg..... | 45.1 | | |

Burlington-Newport, Vt.

| | Miles | | Miles |
|--------------------|-------|---------------------|-------|
| Burlington | 0.0 | Johnson | 38.0 |
| Winoaki | 2.1 | N. Hyde Park . . . | 43.5 |
| Essex Junction. . | 6.5 | Eden | 47.6 |
| Essex | 9.6 | Lowell | 57.7 |
| Jerico | 12.9 | Westfield | 64.3 |
| Underhill | 16.2 | Troy | 66.3 |
| Cambridge | 26.4 | Newport | 77.0 |
| Jeffersonville . . | 29.0 | | |



Newport-Quebec, P. Q.

| Miles | Miles |
|----------------------|-----------------------|
| Newport..... 0.0 | D'Irsaeli 95.5 |
| West Derby..... 0.9 | Colrain 100.9 |
| Derby Line..... 8.3 | Black Lake..... 106.9 |
| Rock Island..... 8.5 | Thetford Mines 111.7 |
| Stanstead..... 9.8 | Robertson 117.3 |
| Massawippi..... 22.3 | Broughton 123.3 |
| Waterville..... 32.1 | Young Junction 133.2 |
| Lemoxville..... 39.3 | St. Joseph..... 141.1 |
| Sand Hill..... 45.7 | Beauce Junction 146.3 |
| Birchton..... 49.4 | St. Marie..... 152.8 |
| Cookshire..... 52.4 | Scott 158.0 |
| Angus..... 58.4 | St. Maxime..... 158.6 |
| Marbleton..... 70.4 | St. Henri..... 172.5 |
| Wedon..... 79.7 | St. Louis..... 177.6 |
| Wedon Lake..... 83.9 | Levis 183.0 |
| Garthby..... 90.3 | Quebec 183.5 |

Burlington-Richford.

| Miles | Miles |
|----------------------|----------------------|
| Burlington..... 0.0 | Enosburg Falls 51.0 |
| Milton..... 19.6 | Sampsonville... 55.0 |
| Georgia..... 26.2 | Enst Berkshire 56.2 |
| St. Albans..... 32.1 | Richford 60.8 |
| Sheldon Springs 41.8 | |

Richford, Vt.-Quebec.

| Miles | Miles |
|----------------------|------------------------|
| Richford..... 0.0 | Danville 72.0 |
| Abercorn..... 3.0 | Warwick 83.7 |
| Sutton Flat..... 9.0 | Arthabaska..... 92.0 |
| Sutton Junction 12.0 | Stanford 105.0 |
| Brome..... 16.0 | Plessisville... 110.7 |
| Knowlton..... 20.9 | St. Julie..... 120.0 |
| Waterloo..... 30.0 | St. Agathe..... 136.0 |
| Warden..... 37.0 | St. Guille..... 145.0 |
| Lawrenceville.. 41.0 | Craig's Rd. Sta. 154.0 |
| Racine..... 48.0 | St. Romauld... 170.0 |
| Melbourne..... 60.0 | Levis 176.0 |
| Richmond..... 61.0 | Quebec 176.5 |

Bangor, Me.-Fredericton, N. B.

| Miles | Miles |
|----------------------|------------------------|
| Bangor..... 0.0 | Sylvan Park 92.0 |
| Holden Center.. 6.0 | Machias..... 93.4 |
| Holden..... 8.8 | East Machias... 97.7 |
| N. Ellsworth... 21.0 | Whiting 110.1 |
| Ellsworth Falls 25.2 | Dennysville... 119.7 |
| Ellsworth..... 26.8 | West Pembroke 125.1 |
| Wash. Junction 28.9 | Pembroke 126.0 |

| | |
|---------------------|--------------------------|
| Hancock..... 36.3 | Bill Cove..... 135.9 |
| Waukeag Sta... 37.1 | Robbinston... 137.3 |
| W. Sullivan... 37.5 | Red Bench..... 141.1 |
| Sullivan..... 39.2 | Calais 149.8 |
| E. Sullivan... 41.9 | St. Steph's, N. B. 150.3 |
| Ashville..... 43.8 | Moose Mills... 157.6 |
| Gouldsboro... 48.6 | Honeydale..... 164.0 |
| Steuben..... 53.3 | Lawrence Sta.. 169.1 |
| Millbridge... 58.8 | Low. Brockway 176.8 |
| Cherryfield... 64.3 | York's Mills... 187.4 |
| Harrington... 70.7 | Harvey 196.2 |
| Columbia Falls 75.6 | Hammondville.. 211.8 |
| Jonesboro..... 84.0 | Spring Hill... 222.2 |
| Whitneyville.. 89.6 | Fredericton... 227.4 |

Augusta, Me.-Quebec, P. Q.

| Miles | Miles |
|----------------------|------------------------|
| Augusta..... 0.0 | Jackman 125.6 |
| Sidney..... 8.9 | Moose River... 126.8 |
| N. Sidney..... 12.7 | Intern. Line... 139.9 |
| Waterville... 19.8 | Armstrong, P. Q. 141.5 |
| Fairfield..... 23.2 | St. Come..... 160.7 |
| E. Fairfield... 30.7 | Jersey Mills... 165.4 |
| Skowhegan... 38.3 | St. George..... 170.1 |
| S. Norrkewock 44.0 | Beauceville... 181.2 |
| Norridgewock.. 44.4 | St. Joseph..... 190.6 |
| Madison..... 52.7 | Beauce June... 195.8 |
| North Anson... 58.0 | St. Marie..... 202.6 |
| Embsden..... 63.2 | Scott's June... 208.1 |
| Solon..... 68.0 | St. Henri..... 221.7 |
| Bingham..... 74.2 | Levis 234.3 |
| Carntunk..... 89.8 | Quebec 234.6 |
| The Forks..... 97.6 | |

Calais, Me.-St. John, N. B.

| Miles | Miles |
|------------------------|----------------------|
| Calais..... 0.0 | Musquash..... 64.3 |
| St. Steph's, N. B. 0.4 | Spruce L. Sta.. 74.0 |
| Onk Bay..... 7.0 | Fairville..... 78.9 |
| St. George..... 35.8 | St. John..... 81.9 |
| Lepraux..... 55.7 | |

Houlton, Me.-Woodstock, N. B.,

14.7 Miles

| Miles | Miles |
|--------------------|-----------------------|
| Houlton, Me... 0.0 | Woodstock, N. B. 14.7 |
| Richmond Cor. 7.8 | |

Woodstock-Fredericton, N. B., 63.4

Miles

| Miles | Miles |
|--------------------|-----------------------|
| Wood's, N. B. 0.0 | Prince William.. 41.5 |
| Meductic..... 12.8 | Hammondville.. 47.3 |
| Hawshaw..... 26.3 | Fredericton... 63.4 |

St. John-Fredericton, N. B., 66.6

Miles.

| Miles | Miles |
|----------------------|---------------------|
| St. John, N. B. 0.0 | Welsford 24.7 |
| Fairville..... 2.9 | Peteraville... 33.2 |
| Grand Bay..... 10.5 | Oromocto 54.2 |
| Westfield B'ch. 14.5 | Fredericton... 66.6 |

St. John, N. B.-Amherst, N. S., 132.8

Miles.

| Miles | Miles |
|---------------------|---------------------|
| St. John, N. B. 0.0 | Petitcodiac... 68.7 |
| Brookville... 4.7 | River Glade... 73.9 |
| Terburna Sta.. 5.8 | Salisbury..... 78.8 |
| Riverside Sta.. 7.4 | Boundary Creek 82.1 |
| Rothsay..... 8.9 | Moncton 92.5 |
| Nauwigewauk.. 17.0 | St. Anselme... 96.8 |
| Lakeside Sta.. 20.9 | Memramcook... 104.3 |

Amherst-Truro, N. S., 92.4 Miles.

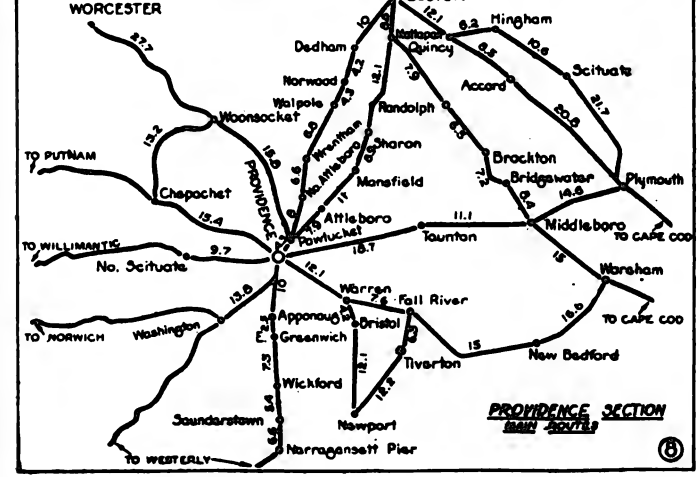
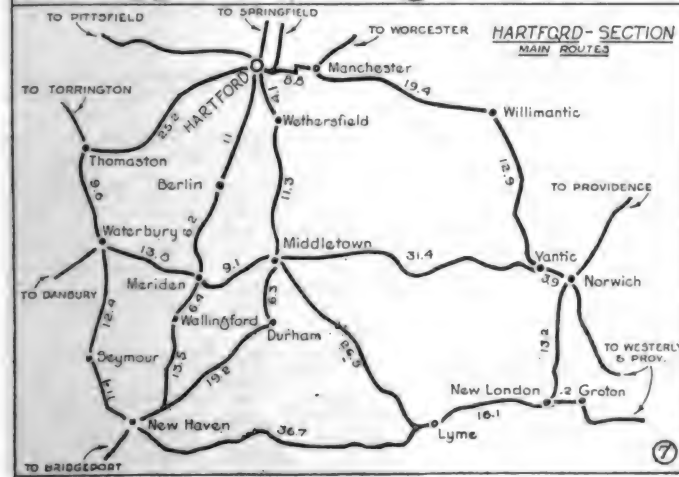
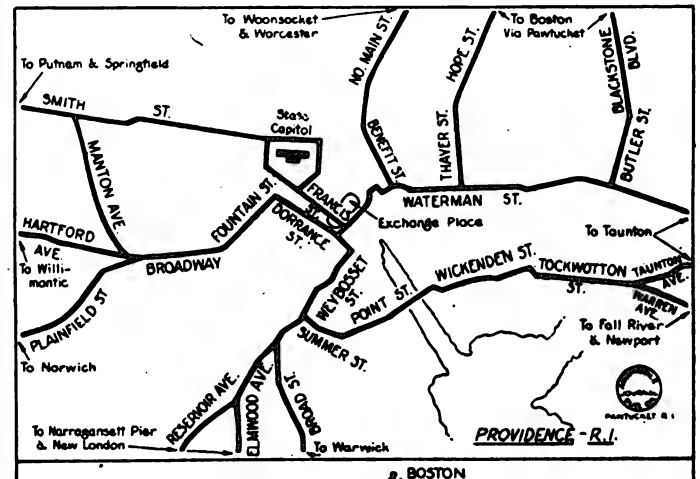
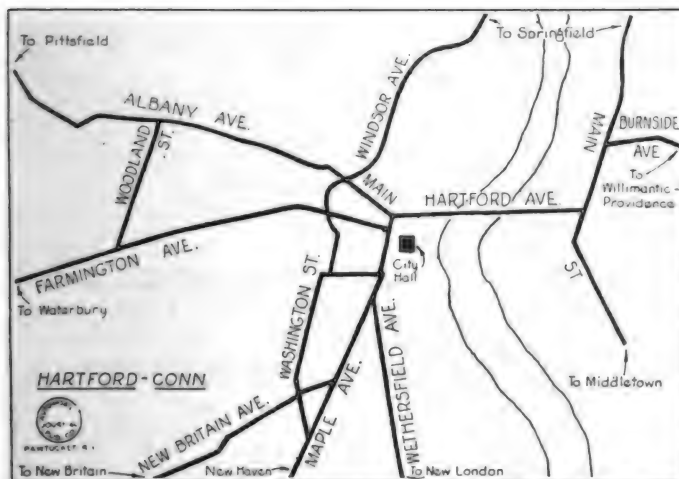
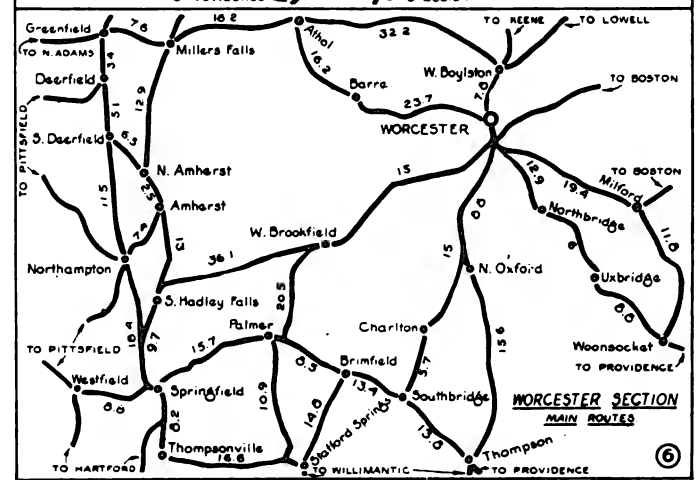
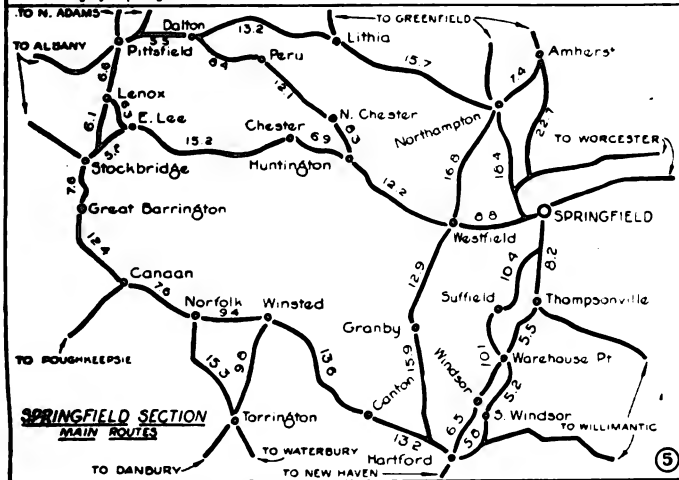
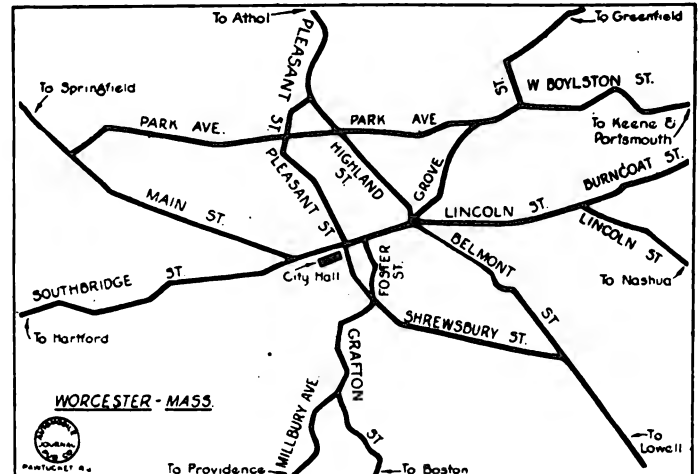
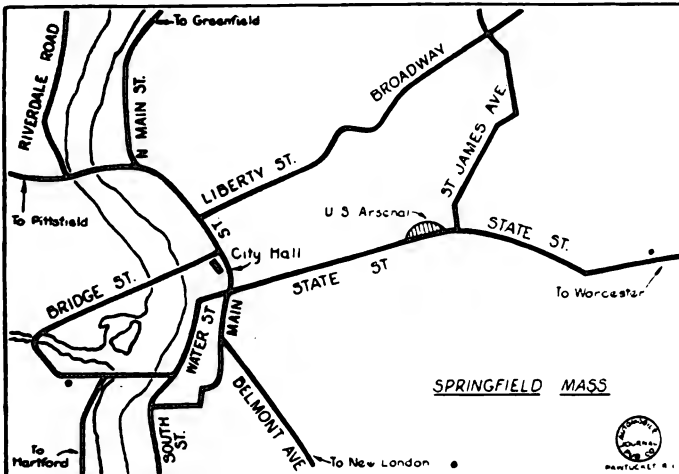
(Via Parrsboro.)

| Miles | Miles |
|----------------------|----------------------|
| Amherst, N. S. 0.0 | Lower Economy. 53.6 |
| Nappan Sta... 6.4 | Economy 57.7 |
| Maccan..... 9.9 | Bass River..... 64.9 |
| Athol..... 13.8 | Portapique... 68.2 |
| Westbrook... 23.2 | Great Village.. 74.8 |
| Parrsboro..... 35.5 | Glenholme... 78.2 |
| Moose River... 43.8 | Manstown..... 81.1 |
| Low. Five Isl's 47.6 | Lower Onslow.. 85.8 |
| Five Islands... 50.7 | Truro 92.4 |

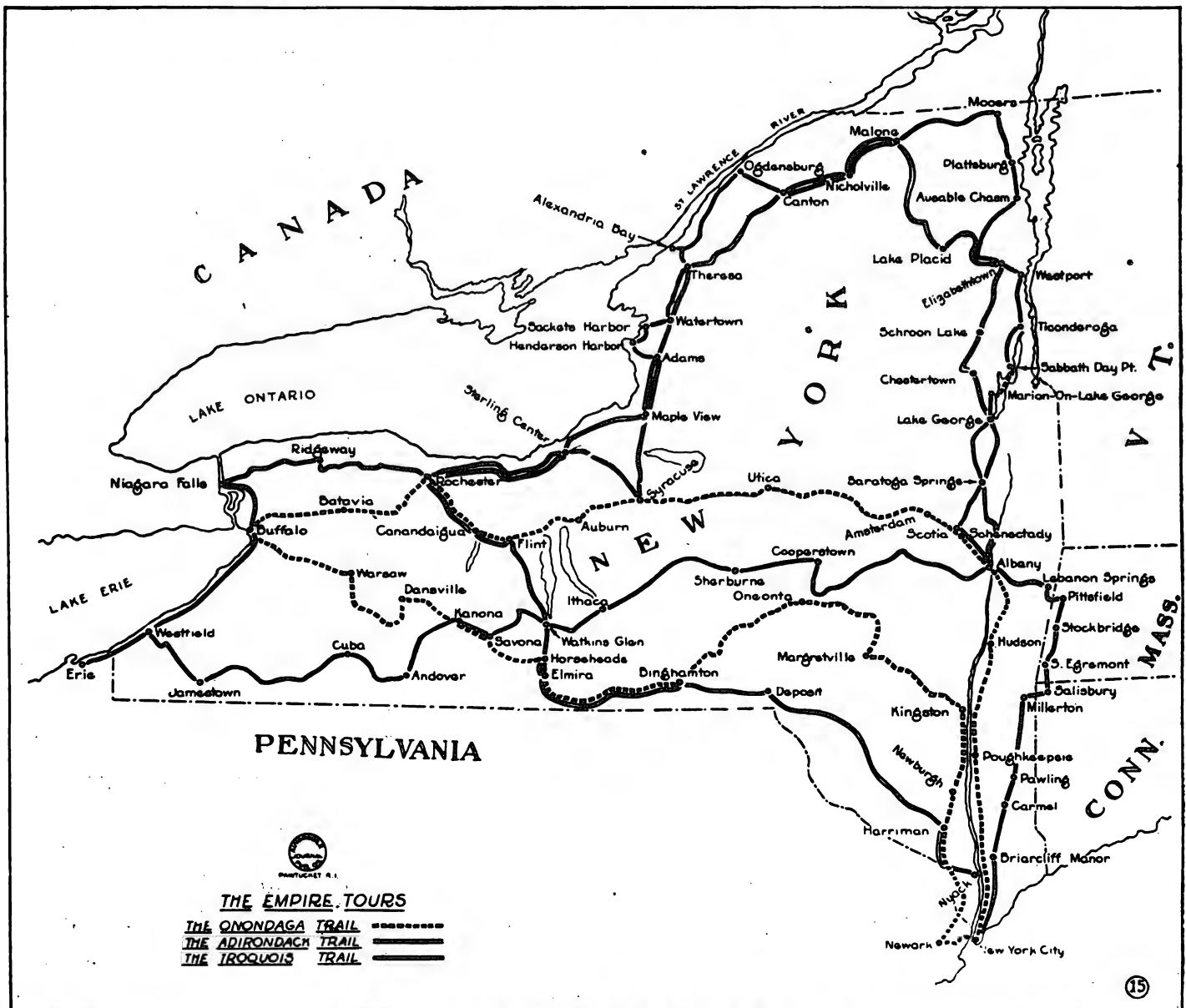
Truro-New Glasgow, N. S., 40.6

Miles.

| Miles | Miles |
|---------------------|----------------------|
| Truro, N. S. 0.0 | Green Hill..... 31.3 |
| Kempton..... 12.9 | Alma 33.9 |
| Salt Spring... 24.9 | New Glasgow... 40.6 |



NEW YORK STATE SHOWING EMPIRE TOURS



The Empire Tours Are Crowded with Interest. The Above Map Shows the Onondaga, Adirondack and Iroquois Trails. Good Roads Go to Make Up These Tours, and the Scenery Is Splendid Throughout.

THE ADIRONDACK TRAIL

New York-Pittsfield.

| Miles | Miles |
|------------------------------------|---------------------------|
| N. Y. (Madison ave. & 43d st.) 0.0 | Carmel 58.6 |
| Yonkers 14.4 | Patterson 68.2 |
| Hast-on-Hud. 17.9 | Pawling 71.8 |
| Dobbs Ferry 18.9 | S. Dover 79.6 |
| Irvington 21.4 | Dover Plains 85.8 |
| Tarrytown 24.1 | Wassau 91.4 |
| Scarboro 28.3 | Amenia 94.8 |
| (Onondaga Trail starts here.) | Millerton 103.6 |
| Briarcliff 31.9 | Lakeville, Ct. 106.9 |
| Kitchawan 38.0 | Salisbury 108.6 |
| Croton Lake St. 38.3 | S. Egremont P. 121.6 |
| Yorktown Hts. 42.7 | G. Barrington 125.6 |
| Amawalk Sta. 44.4 | Stockbridge 133.0 |
| Baldy's P. P. O. 49.4 | Lenox 139.8 |
| Lake Mahopac. 53.0 | Pittsfield 146.4 |

Pittsfield, Mass.-Saratoga Springs.

| Miles | Miles |
|-------------------------|--------------------------|
| Pittsfield 0.0 | Loudenville 40.7 |
| Shaker Village. 4.5 | Newtonville 42.0 |
| New Lebanon. 10.8 | Latham's corn. 43.8 |
| N. Leb. Center. 12.2 | Cohoes 48.2 |
| West Lebanon. 14.9 | Waterford 50.1 |
| Nassau 23.5 | Mechanicville. 58.9 |
| E. Greenbush. 30.8 | Malta 64.8 |
| Rensselaer 35.2 | Malta 67.0 |
| Albany 36.0 | Saratoga Spgs. 75.1 |

Saratoga-Schoon Lake.

| Miles | Miles |
|--------------------------|-------------------------|
| Saratoga 0.0 | Warrensburg 34.2 |
| Wilton 7.4 | Chesterstown. 46.2 |
| S. Glen Falls. 17.8 | Pottersville 55.0 |
| Glen Falls 18.7 | Taylor-on- |

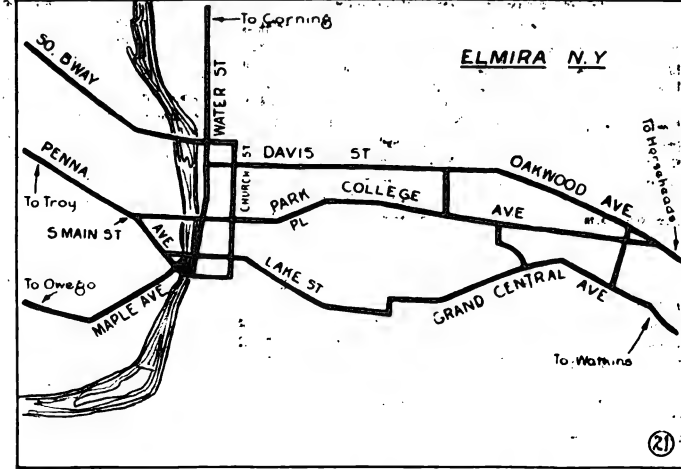
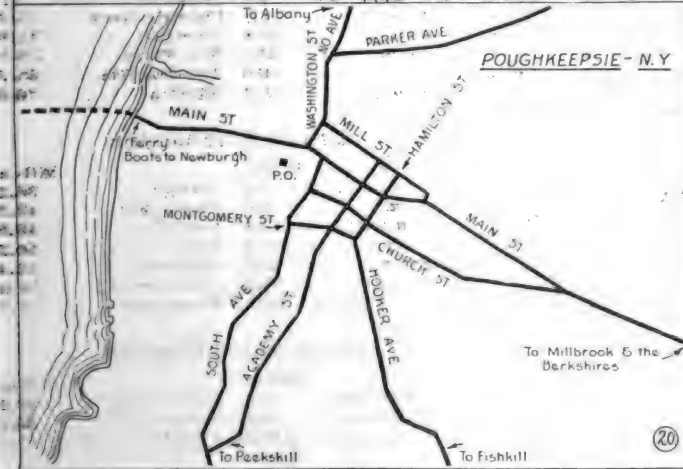
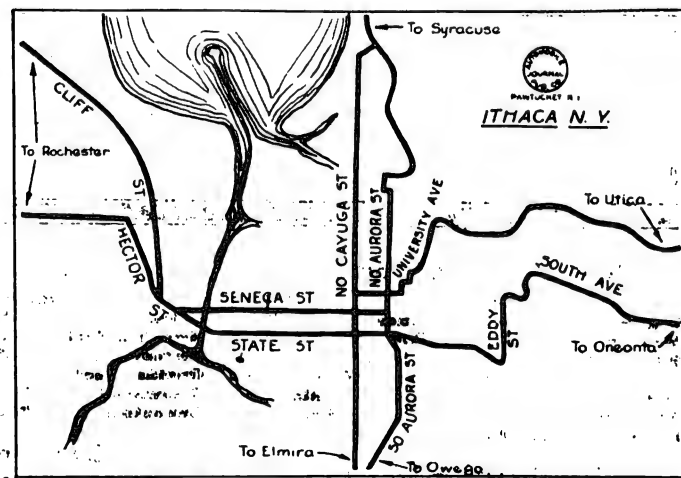
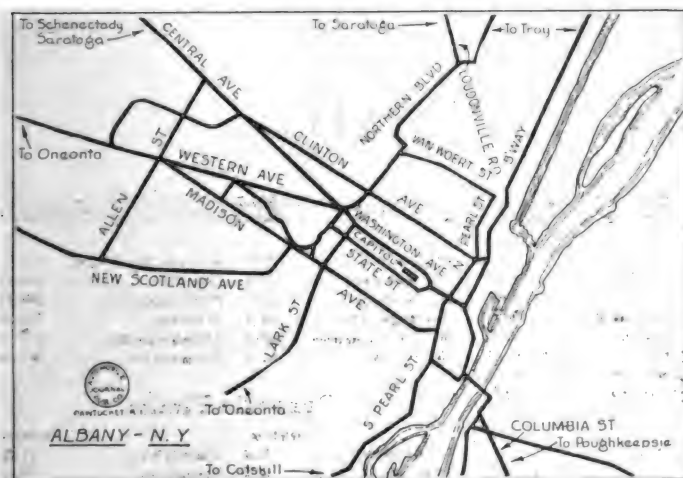
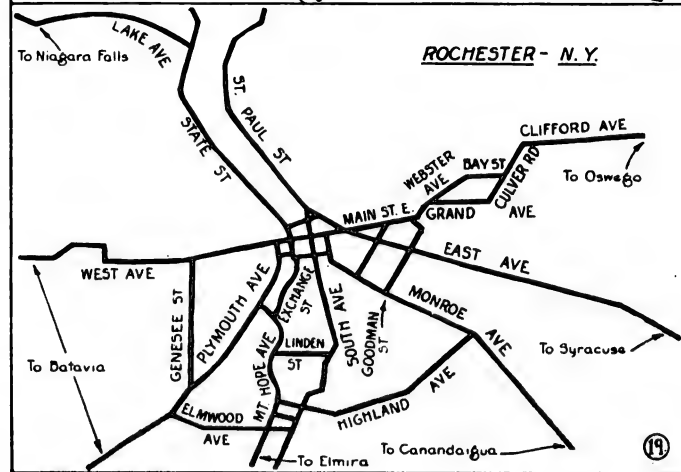
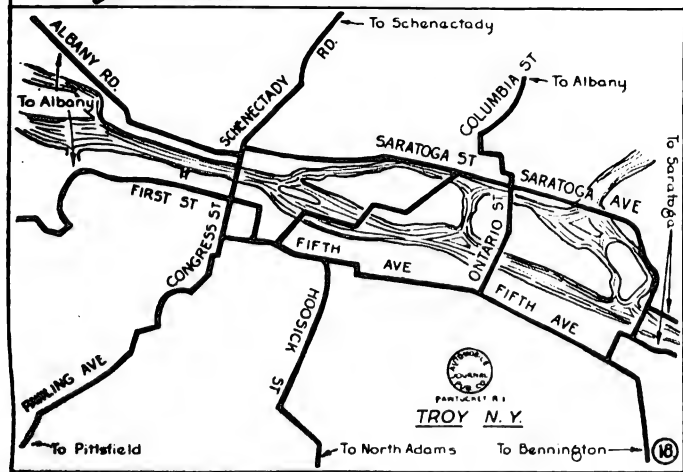
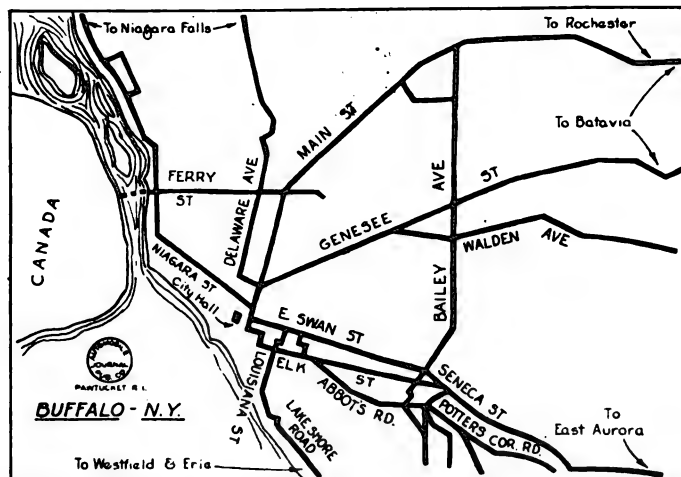
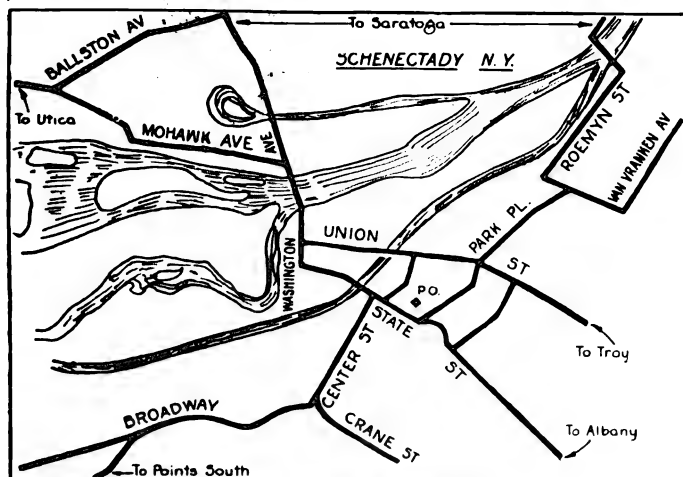
| | |
|---------------------|--------------------|
| French Mount. 24.0 | Schoon 58.7 |
| Lake George... 28.1 | Schoon Lake.. 54.3 |

Schoon Lake-Lake Placid.

| Miles | Miles |
|------------------------|-----------------------|
| Schoon Lake... 0.0 | Jay 53.3 |
| Schoon River. 9.3 | Wilmington 58.0 |
| Euba Mills 21.4 | Willm'ton Notch 58.4 |
| Elizabethtown. 31.5 | Newman 70.8 |
| Keene 43.6 | Lake Placid... 71.4 |
| Upper Jay 49.7 | |

Lake Placid-Malone.

| Miles | Miles |
|------------------------|----------------------|
| Lake Placid... 0.0 | McColloma 28.4 |
| Saranac Lake... 9.5 | Dunne Center.. 40.3 |
| Gabriel Sta. 18.3 | Whippleville .. 54.2 |
| Brighton 20.7 | Malone 57.8 |
| Paul Smith's... 21.8 | |



Malone-Watertown.

| Miles | Miles |
|-----------------------|---------------------|
| Malone..... 0.0 | De Kalb Jet... 60.4 |
| N. Bangor..... 5.3 | Old De Kalb... 64.4 |
| Brushton..... 10.9 | Richville..... 72.0 |
| Molra..... 13.1 | Gouverneur... 78.5 |
| Lawrenceville.. 18.6 | Somerville... 86.1 |
| Nicholville..... 24.9 | Antwerp..... 90.8 |
| Hopkinton..... 27.3 | Theresa..... 102.3 |
| Potsdam..... 41.5 | Pamella..... 112.3 |
| Waterloo..... 43.5 | Watertown... 120.9 |
| Eddy..... 57.3 | |

Watertown-Oswego.

| Miles | Miles |
|-----------------------|--------------------|
| Watertown..... 0.0 | Pulaski..... 31.7 |
| Adams Center... 10.0 | Maple View... 39.4 |
| Adams..... 13.6 | Mexico..... 43.7 |
| Pierrepont Man. 19.4 | New Haven... 48.4 |
| Mannsville..... 21.0 | Scriba..... 54.4 |
| Sandy Creek..... 26.0 | Oswego..... 58.8 |

Oswego-Rochester.

| Miles | Miles |
|-----------------------|----------------------|
| Oswego..... 0.0 | Williamson... 48.1 |
| Sterling Center 12.7 | Ontario..... 53.1 |
| Red Creek..... 21.3 | Ontario Center 54.4 |
| Wolcott..... 27.0 | Fruitland P. O. 56.9 |
| Alton..... 36.8 | Union Hill... 57.9 |
| Wallington Sta. 38.6 | Webster..... 60.8 |
| Sodus..... 41.3 | W. Webster... 64.1 |
| E. Williamson... 45.6 | Rochester... 72.1 |

Rochester-Watkins.

| Miles | Miles |
|---------------------|---------------------|
| Rochester..... 0.0 | Stanley..... 42.0 |
| Pittsford..... 7.6 | Halls Corners 45.6 |
| Mendon..... 14.1 | Benton Center 50.6 |
| Victor..... 19.4 | Penn Yan.... 54.6 |
| Canandaigua... 29.8 | Dundee..... 66.6 |
| Hopewell..... 37.3 | Reading Center 74.6 |
| Flint..... 39.3 | Watkins..... 79.7 |

Watkins-Elmira.

| Miles | Miles |
|--------------------|-----------------------|
| Watkins..... 0.0 | Horsesheds... 16.4 |
| Montour Falls. 2.9 | Elmira Hts. Sta. 19.1 |

| | |
|----------------------|------------------|
| Millport..... 9.3 | Elmira..... 22.3 |
| Pine Valley.... 12.0 | |

Elmira-Binghamton.

| Miles | Miles |
|----------------------|--------------------|
| Elmira..... 0.0 | Owego..... 36.3 |
| Lowman..... 6.5 | Apalachin... 43.3 |
| Chemung..... 12.4 | Vestal..... 49.5 |
| Waverly..... 17.1 | Union..... 50.3 |
| Fork..... 17.9 | Endicott.... 52.4 |
| Barton..... 23.8 | Johnson City 56.0 |
| Smithboro..... 26.5 | Binghamton... 58.6 |
| Tioga Center... 30.5 | |

Binghamton-Liberty.

| Miles | Miles |
|---------------------|----------------------|
| Binghamton... 0.0 | Horton..... 63.5 |
| Windsor..... 15.6 | Cook's Falls... 66.3 |
| Damascus..... 17.9 | Roscoe..... 72.0 |
| Deposit..... 31.0 | Livingston Man. 78.8 |
| Hale Eddy..... 35.9 | Parkville Sta. 84.3 |
| Hancock..... 44.3 | Liberty..... 88.3 |

Liberty-Goshen.

| Miles | Miles |
|----------------------|---------------------|
| Liberty..... 0.0 | Bloomington... 28.5 |
| Monticello..... 13.1 | Middletown... 36.7 |
| Wartsboro..... 24.1 | Goshen..... 45.1 |
| High View..... 27.3 | |

Goshen-New York.

| Miles | Miles |
|----------------------|-------------------------------------|
| Goshen..... 0.0 | Nanuet..... 35.9 |
| Chester..... 4.3 | Nyack..... 41.0 |
| Monroe..... 9.3 | Tarrytown... 41.8 |
| Harriman..... 11.5 | Irvington... 44.5 |
| Southfields... 16.7 | Dobbs Ferry... 46.0 |
| Tuxedo..... 20.8 | Hastings..... 47.8 |
| Sloatsburg..... 23.5 | Yonkers..... 52.0 |
| Suffern..... 27.6 | 43d and Madison ave., N. Y. C. 65.6 |
| Monsey..... 32.2 | |
| Spring Valley.. 33.4 | |

NIAGARA FALLS TOUR.**New York-Poughkeepsie.**

| Miles | Miles |
|-------------------|------------------|
| New York..... 0.0 | Harmon..... 32.7 |

| | |
|---------------------|-----------------------|
| Yonkers..... 14.4 | Croton..... 33.8 |
| Hast-on-Hud... 17.9 | Peekskill.... 41.5 |
| Dobbs Ferry... 18.9 | Fishkill Village 60.9 |
| Irvington..... 21.4 | Wap'gers Falls 66.0 |
| Tarrytown..... 24.1 | Poughkeepsie 73.7 |
| Ossing..... 30.0 | |

Poughkeepsie-Albany.

| Miles | Miles |
|---------------------------------|-----------------------|
| Poughkeepsie.. 0.0 | Blue Stores... 30.8 |
| Hyde Park..... 6.3 | Livingston... 34.0 |
| Staatsburg..... 10.2 | Hudson..... 42.3 |
| Rhinebeck..... 16.3 | Stockport.... 48.2 |
| Red Hook..... 21.7 | Stuyv'sant Falls 51.7 |
| Up. Red Hook.. 24.4 | Kinderhook... 54.9 |
| Nevis..... 27.0 | Valatie..... 56.0 |
| Clermont..... 28.9 | E. Greenbush... 54.9 |
| (Adirondack Trail Starts Here.) | |
| Rensselaer..... 74.4 | Albany..... 75.3 |

Albany-Utica.

| Miles | Miles |
|----------------------|----------------------|
| Albany..... 0.0 | Nelliston.... 56.0 |
| Schenectady... 14.9 | St. Johnsville 61.9 |
| Scotia..... 16.5 | Little Falls... 72.2 |
| Amsterdam..... 30.8 | Herkimer..... 79.3 |
| Fort Johnson... 33.7 | Mohawk..... 80.9 |
| Tribes Hill.... 36.1 | Ihon..... 82.5 |
| Fonda..... 41.5 | Frankfort.... 85.0 |
| Palatine Bridge 53.1 | Utica..... 94.6 |

Utica-Syracuse.

| Miles | Miles |
|----------------------|---------------------|
| Utica..... 0.0 | Chittenango... 34.0 |
| New Hartford. 3.0 | Mycenne..... 37.3 |
| Vernon..... 16.5 | Manlius Center 41.3 |
| Oneida Castle.. 21.7 | East Syracuse 45.1 |
| Wampsville..... 24.9 | Syracuse..... 45.9 |
| Canastota..... 27.3 | |

Syracuse-Rochester.

| Miles | Miles |
|----------------------|---------------------|
| Syracuse..... 0.0 | Flint..... 57.9 |
| Camillus..... 8.3 | Hopewell..... 60.0 |
| Elbridge..... 15.3 | Canandaigua... 67.4 |
| Sennett..... 20.4 | Victor..... 77.6 |
| Auburn..... 25.4 | Mendon..... 83.0 |
| Seneca Falls... 40.1 | Pittsford..... 89.6 |
| Waterloo..... 43.5 | Rochester... 97.2 |

THE ONONDAGA TRAIL

New York-Poughkeepsie.

| Miles | Miles |
|---------------------|-----------------------|
| New York..... 0.0 | Harmon..... 32.7 |
| Yonkers..... 14.4 | Croton..... 33.8 |
| Hast-on-Hud... 17.9 | Peekskill.... 41.5 |
| Dobbs Ferry... 18.9 | Fishkill Village 60.9 |
| Irvington..... 21.4 | Wap'gers Falls 66.0 |
| Tarrytown..... 24.1 | Poughkeepsie 73.7 |
| Ossing..... 30.0 | |

Poughkeepsie-Albany.

| Miles | Miles |
|---------------------------------|-----------------------|
| Poughkeepsie.. 0.0 | Blue Stores... 30.8 |
| Hyde Park..... 6.3 | Livingston... 34.0 |
| Staatsburg..... 10.2 | Hudson..... 42.3 |
| Rhinebeck..... 16.3 | Stockport.... 48.2 |
| Red Hook..... 21.7 | Stuyv'sant Falls 51.7 |
| Up. Red Hook.. 24.4 | Kinderhook... 54.9 |
| Nevis..... 27.0 | Valatie..... 56.0 |
| Clermont..... 28.9 | E. Greenbush... 54.9 |
| (Adirondack Trail Starts Here.) | |
| Rensselaer..... 74.4 | Albany..... 75.3 |

Albany-Utica.

| Miles | Miles |
|----------------------|----------------------|
| Albany..... 0.0 | Nelliston.... 56.0 |
| Schenectady... 14.9 | St. Johnsville 61.9 |
| Scotia..... 16.5 | Little Falls... 72.2 |
| Amsterdam..... 30.8 | Herkimer..... 79.3 |
| Fort Johnson... 33.7 | Mohawk..... 80.9 |
| Tribes Hill.... 36.1 | Ihon..... 82.5 |
| Fonda..... 41.5 | Frankfort.... 85.0 |
| Palatine Bridge 53.1 | Utica..... 94.6 |

Utica-Syracuse.

| Miles | Miles |
|----------------------|---------------------|
| Utica..... 0.0 | Chittenango... 34.0 |
| New Hartford. 3.0 | Mycenne..... 37.3 |
| Vernon..... 16.5 | Manlius Center 41.3 |
| Oneida Castle.. 21.7 | East Syracuse 45.1 |
| Wampsville..... 24.9 | Syracuse..... 45.9 |
| Canastota..... 27.3 | |

Syracuse-Rochester.

| Miles | Miles |
|----------------------|---------------------|
| Syracuse..... 0.0 | Flint..... 57.9 |
| Camillus..... 8.3 | Hopewell..... 60.0 |
| Elbridge..... 15.3 | Canandaigua... 67.4 |
| Sennett..... 20.4 | Victor..... 77.6 |
| Auburn..... 25.4 | Mendon..... 83.0 |
| Seneca Falls... 40.1 | Pittsford..... 89.6 |
| Waterloo..... 43.5 | Rochester... 97.2 |
| Geneva..... 51.0 | |

Rochester-Buffalo.

| Miles | Miles |
|---------------------|----------------------|
| Rochester..... 0.0 | Patavin..... 37.3 |
| Scottsville... 12.4 | East Pembroke 43.4 |
| Garbutt..... 14.7 | Pembroke..... 50.3 |
| Mumford..... 18.9 | Clarence..... 58.3 |
| Caladonia..... 20.2 | Williamsville.. 66.2 |
| LeRoy..... 27.3 | Snyder..... 68.2 |
| Stafford..... 31.4 | Buffalo..... 75.9 |

Buffalo-Dansville.

| Miles | Miles |
|------------------|--------------------|
| Buffalo..... 0.0 | Rock Glen.... 47.0 |

| | |
|----------------------|-----------------------|
| Ebenezer..... 7.9 | Silver Springs.. 51.1 |
| E. Aurora..... 17.5 | Castile..... 54.9 |
| Varysburg..... 32.8 | Portageville... 59.9 |
| Orangeville... 36.4 | Hunts..... 64.4 |
| Halls Corners.. 39.1 | Canaseraga... 73.4 |
| Warsaw..... 42.3 | Danville..... 85.9 |

Dansville-Elmira.

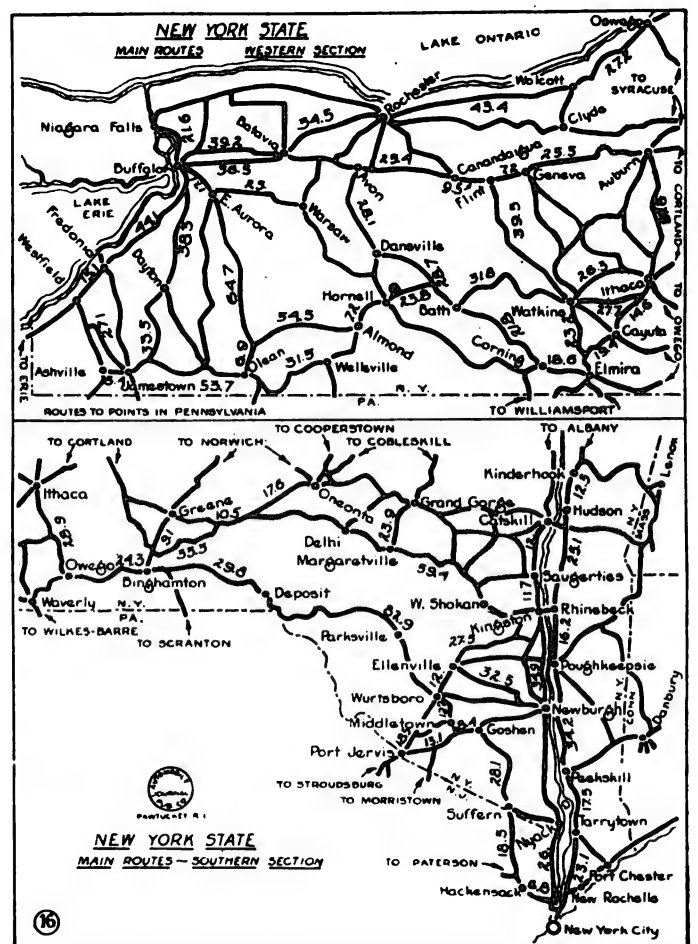
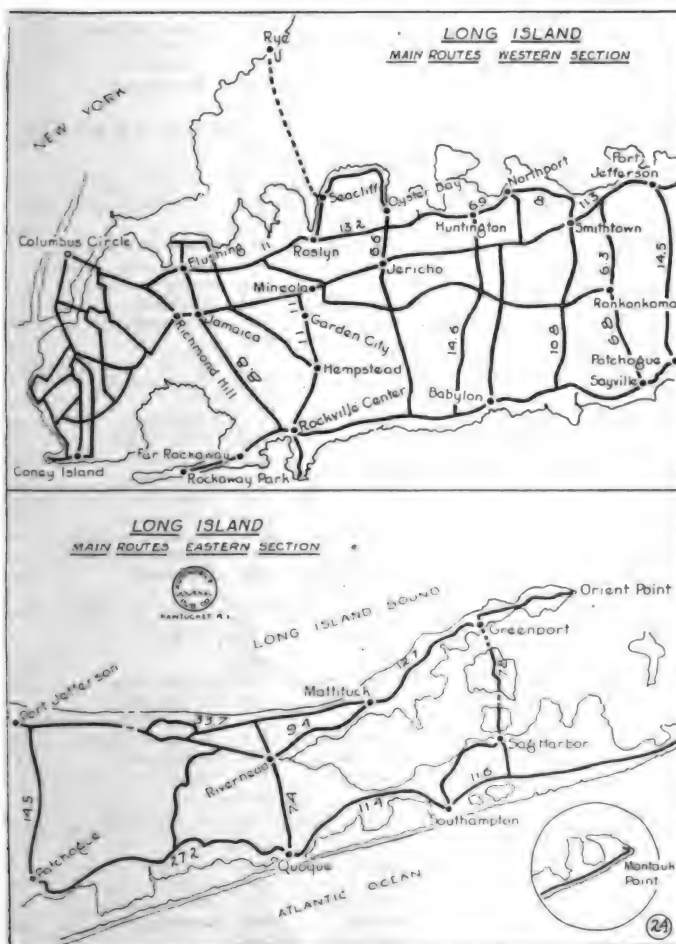
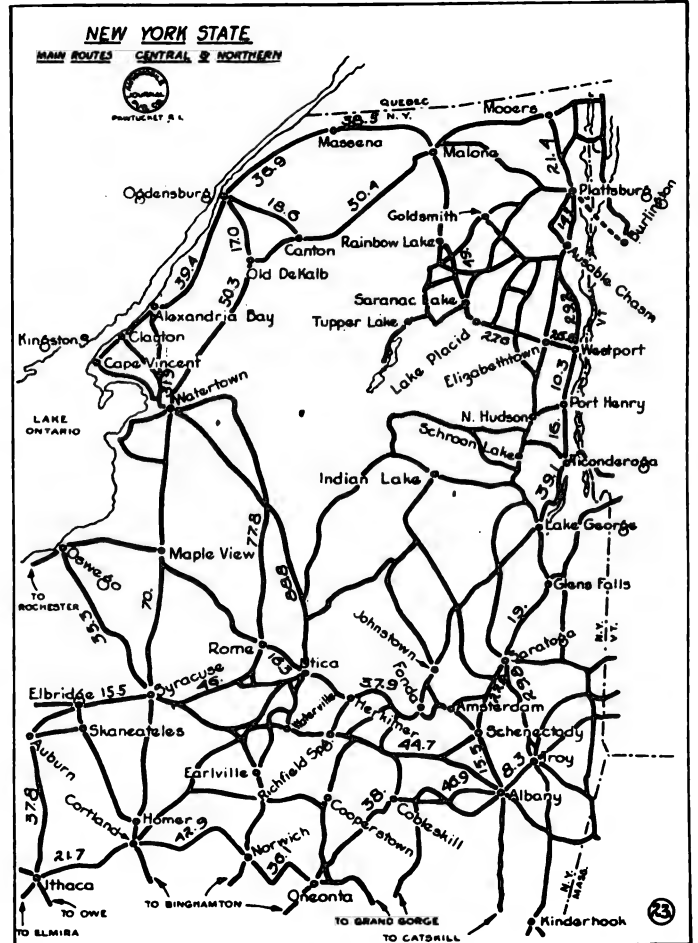
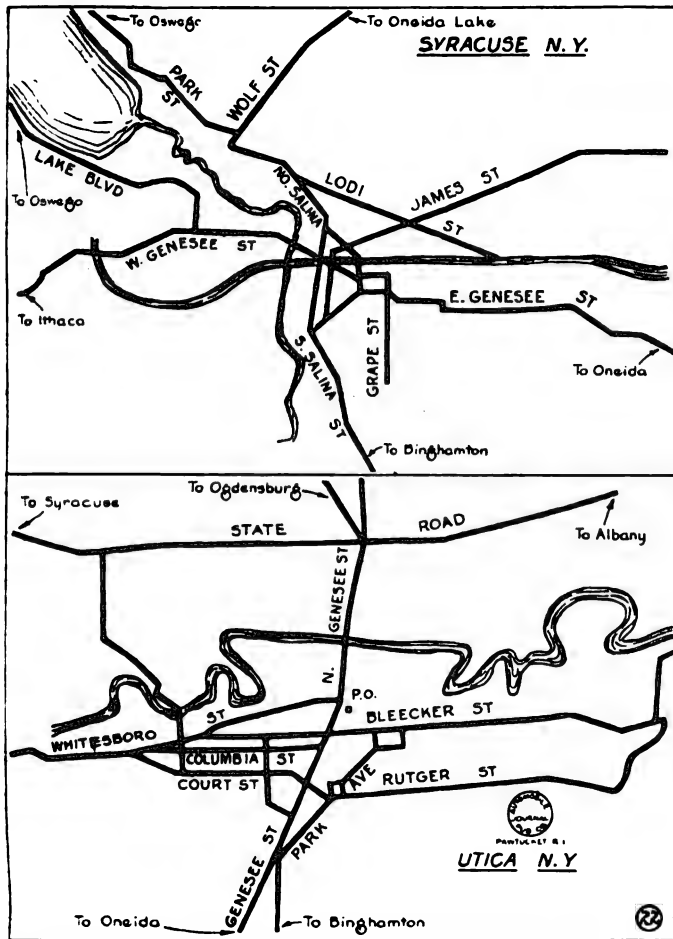
| Miles | Miles |
|--------------------|----------------------|
| Dansville..... 0.0 | Campbell..... 41.5 |
| Wayland..... 6.3 | Coopers..... 46.2 |
| Cohocton..... 14.7 | Painted Post... 49.3 |
| Avoca..... 23.4 | Corniaing.... 51.8 |
| Kanona..... 26.8 | Big Flats..... 53.7 |
| Bath..... 30.6 | Elmira Hts... 65.3 |
| Savona..... 37.0 | Elmira..... 70.6 |

Elmira-Binghamton.

| Miles | Miles |
|----------------------|--------------------|
| Elmira..... 0.0 | Owego..... 36.3 |
| Lowman..... 6.5 | Apalachin... 43.3 |
| Chemung..... 12.4 | Vestal..... 49.5 |
| Waverly..... 17.1 | Union..... 50.2 |
| Barton..... 23.8 | Endicott.... 52.4 |
| Smithboro..... 26.5 | Johnson City 56.0 |
| Tioga Center... 30.5 | Binghamton... 58.6 |

Binghamton-Oneonta.

| Miles | Miles |
|----------------------|---------------------|
| Binghamton... 0.0 | Bainbridge.... 38.2 |
| Port Crane..... 7.3 | Sidney..... 39.4 |
| Sanitaria Spgs. 10.9 | Unadilla..... 43.4 |



| | | | |
|-----------------|------|------------------|------|
| Relden..... | 16.8 | Wells Bridge.... | 40.2 |
| Harpurville.... | 20.3 | Otego..... | 53.6 |
| Nineveh..... | 22.1 | Oneonta..... | 61.8 |
| Afton..... | 27.4 | | |

Oneonta-Kingston.

| | Miles | | Miles |
|------------------------|-------|------------------------|-------|
| Oneonta | 0.0 | Highmont | 62.8 |
| Davenport Gen. | 8.6 | Pine Hill | 64.9 |
| Davenport | 13.0 | Shandaken | 69.8 |
| Harpersfield | 22.5 | Allagen | 71.4 |
| Stamford | 27.0 | Phoenicia | 75.7 |
| Grand Gorge | 35.0 | Mt. Pleasant | 79.5 |
| Roxbury | 42.4 | Holceville | 83.0 |

| | | | |
|------------------|------|-----------------|-------|
| Haleotaville.... | 48.6 | Shokan..... | 86.9 |
| Kelley Cors.... | 50.5 | Ashokan..... | 87.8 |
| Margaretville.. | 54.2 | West Hurley.... | 94.2 |
| Arkville..... | 55.7 | Kingston..... | 101.0 |
| Flieschmanns... | 60.6 | | |

Kingston-Newburgh.

| | Miles | | Miles |
|----------------|-------|-----------------|-------|
| Kingston..... | 0.0 | Highland..... | 16.9 |
| Bondout..... | 2.4 | Milton..... | 21.3 |
| Port Ewen.... | 3.2 | Marlboro..... | 25.3 |
| Ulster Park... | 6.6 | Middle Hope.... | 29.0 |
| Esopus..... | 9.0 | Newburgh..... | 33.3 |

Newburgh-New York.

| | Miles | | Miles |
|-----------------|-------|-----------------|-------|
| Newburgh..... | 0.0 | Ramsey..... | 37.2 |
| Vails Gate..... | 4.8 | Allendale..... | 39.1 |
| Woodbury..... | 12.2 | Hoohokus..... | 41.5 |
| Highland Mills | 13.9 | Arcola..... | 47.0 |
| Central Valley | 15.1 | Hasbrouck Hts. | 52.8 |
| Harriman Sta. | 17.0 | Rutherford..... | 55.4 |
| Southfields.... | 22.0 | W. Arlington... | 59.8 |
| Tuxedo..... | 26.1 | Newark..... | 63.7 |
| Slonatsburg.... | 28.8 | Jersey City.... | 69.1 |
| Suffern..... | 32.9 | New York..... | 74.9 |
| Mahwah..... | 34.6 | | |

THE IROQUOIS TRAIL

Erie, Pa.-Buffalo, N. Y.

| | Miles | | Miles |
|------------------|-------|-----------------|-------|
| Erie..... | 0.0 | Irving..... | 60.7 |
| Harbour Creek | 8.2 | Farnham..... | 62.7 |
| Moorheadville.. | 11.0 | Brant..... | 66.6 |
| North East, Pa. | 15.2 | Angola..... | 70.2 |
| Ripley, N. Y.... | 22.7 | Evans..... | 71.7 |
| Forayth..... | 26.3 | Jerusalem Cors. | 73.8 |
| Westfield..... | 30.5 | Waukegan..... | 80.9 |
| Portland..... | 37.4 | Lake View..... | 82.6 |
| Broeton..... | 38.9 | Athol Springs.. | 83.8 |
| Lamberton..... | 41.7 | Bay View..... | 84.8 |
| Fredonia..... | 45.6 | Wood's Beach.. | 86.1 |
| Sheridan..... | 51.5 | Buffalo..... | 93.0 |
| Silver Creek.... | 57.3 | | |

Buffalo-Niagara.

| Miles | Miles |
|----------------------|----------------------|
| Buffalo..... 0.0 | Niagara Falls.. 26.4 |
| St. Johnsbury.. 16.2 | |

Niagara Falls-Rochester.

| | Miles | | Miles |
|----------------|-------|-----------------|-------|
| Niagara Falls. | 0.0 | Albion..... | 57.3 |
| Pekin..... | 13.6 | Holly..... | 66.9 |
| Cambria..... | 20.6 | Brockport.... | 72.0 |
| Wright's Corn. | 26.8 | Clarkson..... | 73.1 |
| Ridge Rd. Vil. | 29.5 | Garland..... | 75.0 |
| Hartland..... | 33.3 | Parma..... | 80.0 |
| Johnson Creek. | 36.1 | W. Greece..... | 81.9 |
| Jeddo..... | 39.5 | Greece..... | 84.9 |
| Ridgeway..... | 42.8 | Uptonville Sta. | 88.2 |
| Medina..... | 46.5 | Rochester..... | 91.4 |

Rochester-Syracuse.

| Miles | Miles | | |
|-----------------|-------|-----------------|------|
| Rochester..... | 0.0 | Wolcott..... | 45.1 |
| W. Webster.... | 8.0 | Red Creek..... | 50.9 |
| Webster..... | 11.3 | Bear Haven.... | 56.1 |
| Fruitland..... | 16.1 | Sterling Center | 59.4 |
| Ontario Center | 17.7 | Hannibal..... | 63.1 |
| Ontario..... | 19.0 | Granby Center. | 68.8 |
| Williamson..... | 24.0 | Fulton..... | 71.9 |
| E. Williamson. | 26.5 | Phoenix..... | 80.8 |
| Sodus..... | 30.8 | Three River Pt. | 83.0 |
| Wallington.... | 33.5 | Liverpool..... | 91.1 |
| Alton..... | 35.3 | Syracuse..... | 96.0 |

Syracuse-Watertown.

| Miles | Miles |
|----------------------|-----------------------|
| Syracuse..... 0.0 | Mannville..... 47.5 |
| Cicero..... 9.4 | Pierrepont Man. 49.1 |
| Brewerton P. O. 13.8 | Adams..... 54.9 |
| Hastings Centr 19.3 | Roberts Cor..... 60.3 |
| Hastings P. O. 23.2 | Henderson..... 64.4 |
| Colosse..... 26.5 | Henderson Har. 66.6 |
| Maple View.... 29.1 | Sackett's Harbor 75.1 |
| Pulaski..... 36.8 | Watertown.... 85.5 |
| Sandy Creek.... 42.5 | |

Watertown-Ogdensburg.

| | Miles | | Miles |
|---------------------|-------|----------------------|-------|
| Watertown | 0.0 | Oakvale | 45.2 |
| Pamella | 8.7 | Hammond | 49.0 |
| Theresa | 18.6 | Briarhill | 55.3 |
| Pleasels | 24.2 | Morristown | 59.5 |
| Alexandria Bay | 30.3 | Ogdensburg | 70.5 |
| Redwood | 37.3 | | |

Ogdensburg-Malone.

| Miles | | Miles | |
|---------------|-----|------------------|------|
| Ogdensburg... | 0.0 | Lawrenceville... | 52.2 |

| | | | |
|-----------------|------|----------------|------|
| Canton..... | 18.5 | Moira..... | 57.7 |
| Potsdam..... | 29.3 | Brushton..... | 59.9 |
| Hopkinton..... | 43.6 | N. Bangor..... | 65.5 |
| Nicholville.... | 45.9 | Malone..... | 70.8 |

Malone-Plattsburg.

| | Miles | | Miles |
|----------------|-------|----------------|-------|
| Malone..... | 0.0 | Mooers..... | 39.8 |
| Burek..... | 7.3 | Selota..... | 44.8 |
| Chateaugay.... | 12.3 | W. Chazy..... | 50.6 |
| Ellenburg Cen. | 25.0 | Beekmantown.. | 54.2 |
| Ell'burg Depot | 27.7 | E. Beck'town.. | 56.1 |
| Mooers Forks.. | 36.7 | Plattsburg.... | 60.7 |

Plattsburg-Elizabethtown.

| | Miles | | Miles |
|-----------------|-------|-----------------|-------|
| Plattsburg..... | 0.0 | Jay | 32.6 |
| Assable Chasm | 13.2 | Upper Jay..... | 36.2 |
| Keeseville..... | 15.3 | Keene..... | 42.3 |
| Clintonville.. | 21.2 | Elizabethtown.. | 54.4 |
| Assable Forks. | 26.7 | | |

Elizabethtown-Saratoga.

| | Miles | | Miles |
|------------------|-------|-----------------|-------|
| Elizabethtown. | 0.0 | Bolton..... | 51.8 |
| Westport..... | 9.1 | Marlon-on-Lake | |
| End of road.... | 18.9 | George..... | 54.2 |
| Port Henry.... | 19.2 | Diamond Point. | 55.9 |
| Fork..... | 19.5 | Lake George.... | 59.8 |
| Crown Point.... | 26.5 | Luzerne..... | 71.8 |
| Ticonderoga.... | 35.1 | Corinth..... | 77.4 |
| Hague..... | 44.1 | S. Corinth..... | 81.5 |
| Silver Bay..... | 47.8 | Greenfield Cen. | 86.3 |
| Sabbath Day Pt. | 49.9 | Saratoga Spgs.. | 91.6 |
| Bt. Ld for Bol'n | 50.0 | | |

Saratoga-Albany.

| Miles | | Miles |
|---------------------|-----------------|-------|
| Saratoga Spgs. 0.0 | Scotia..... | 21.8 |
| Ballston Spa... 6.8 | Schenectady.... | 23.3 |
| Ballston Lake. 13.6 | Woodlawn..... | 26.6 |
| Burnt Hills... 14.6 | Albany..... | 38.4 |

Albany-Cooperstown.

| Miles | | Miles |
|-----------------|------|-----------------------|
| Albany..... | 0.0 | Richmondville.. 52.8 |
| Delmar..... | 5.4 | E. Worcester.... 59.8 |
| Clarksville.... | 13.5 | Worcester..... 64.5 |
| E. Berne..... | 21.2 | Schenectady.... 69.8 |
| Berne..... | 25.0 | Maryland..... 73.2 |
| W. Berne..... | 27.8 | Cooper's Junc. 78.0 |
| Gallupville.... | 31.7 | Colliersville.. 79.7 |
| Vrooman's Cor. | 35.6 | Portlandville.. 83.4 |
| Central Bridge | 39.0 | Milford..... 87.9 |
| Cobleskill..... | 47.8 | Cooperstown... 96.2 |
| Warnerville.... | 49.1 | |

Cooperstown-Watkins.

| Miles | | Miles | |
|----------------|------|----------------|-------|
| Cooperstown... | 0.0 | De Ruyter..... | 57.3 |
| Fly Creek..... | 5.5 | Truxton..... | 65.7 |
| Oakville..... | 6.7 | Cortland..... | 76.8 |
| Burlington.... | 13.2 | Dryden..... | 86.9 |
| W. Burlington. | 17.0 | Ithaca..... | 98.7 |
| Edmeston..... | 20.0 | Newfield..... | 106.4 |
| Sherburne..... | 33.8 | Alpine..... | 116.0 |
| Smyrna..... | 38.1 | Odesa..... | 120.0 |
| Bonney..... | 43.8 | Montour Falls. | 123.3 |
| Otselic..... | 46.7 | Watkins..... | 126.2 |

Watkins-Hornell.

| Miles | | Miles | |
|---------------|------|--------------|------|
| Watkins..... | 0.0 | Bath..... | 29.6 |
| Tyrone..... | 9.9 | Kanona..... | 33.4 |
| Bradford..... | 14.6 | Howard..... | 42.3 |
| Sonora..... | 18.8 | Hornell..... | 53.6 |
| Savona..... | 23.3 | | |

Hornell-Jamestown.

| | Miles | | Miles |
|-----------------|-------|----------------|-------|
| Hornell..... | 0.0 | Olean..... | 67.0 |
| Almond..... | 5.3 | Alleghany..... | 71.0 |
| Alfred Station. | 9.1 | Vandalla..... | 75.9 |
| Andover..... | 17.8 | Carrollton.... | 79.9 |
| Wellsville..... | 26.6 | Salamanca.... | 85.9 |
| Selo..... | 31.4 | Red House..... | 92.7 |
| Belmont..... | 36.3 | Steamburg.... | 98.2 |
| Belvidere..... | 39.4 | Randolph..... | 104.7 |
| Friendship.... | 44.0 | Kennedy..... | 112.1 |
| Cuba..... | 51.7 | Falconer..... | 118.5 |
| Hinadale..... | 60.2 | Jamestown..... | 121.2 |

Jamestown-Westfield.

| Miles | | Miles | |
|---------------|-----|------------------|------|
| Jamestown.... | 0.0 | Dewittville..... | 14.3 |
| Fluvanna..... | 4.0 | Hartfield..... | 17.0 |
| Bemus Point.. | 7.9 | Mayville..... | 19.0 |
| Bay View..... | 9.2 | Westfield..... | 25.3 |

SIDE TRIPS INTO VERMONT.

Ticonderoga, N. Y.-Brandon, Vt.

| | Miles | | Miles |
|-----------------|-------|------------------|-------|
| Ticonderoga... | 0.0 | Ticonderoga..... | 0.0 |
| Ft. Ticond'ga.. | 2.0 | Montcalm Ferry | 1.9 |
| Larrabee's Pt. | 2.2 | Orwell..... | 7.8 |
| Orwell..... | 8.1 | Sudbury..... | 12.9 |
| Sudbury..... | 13.2 | Brandon..... | 20.6 |
| Brandon..... | 20.9 | | |

Saratoga Springs, N. Y.-Rutland, Vt.

| | Miles | | Miles |
|----------------|-------|-------------------|-------|
| Saratoga Spgs. | 0.0 | Comstock | 35.4 |
| Wilton | 7.5 | Whitehall | 42.6 |
| S. Glens Falls | 17.9 | Fairhaven, Vt. | 53.6 |
| Glens Falls | 18.8 | Hydeville | 56.0 |
| Hudson Falls | 22.4 | Castleton Corners | 58.3 |
| Moss Street | 23.4 | Castleton | 57.9 |
| Kingsbury | 27.1 | West Rutland | 65.0 |
| Fort Ann | 33.4 | Center Rutland | 67.2 |
| Dewey's Bdge. | 33.9 | Rutland | 68.9 |

Saratoga Springs, N. Y.-Manchester, Vt.

| | Miles | | Miles |
|-----------------|-------|------------------|-------|
| Saratoga Spgs. | 0.0 | Cambridge..... | 26.0 |
| Gravel Hill... | 2.1 | E. Salem..... | |
| | | (Engelville) | 31.3 |
| Grangerville.. | 8.5 | W. Arlington.... | 35.6 |
| Schuylerville.. | 11.3 | Arlington..... | 41.8 |
| Greenwich.... | 17.4 | Manchester..... | 51.9 |
| Colla..... | 24.6 | | |

Rouse's Point, N. Y.-Burlington, Vt.

| | Miles | | Miles |
|------------------|-------|-----------------|-------|
| Rouse's Point. | 0.0 | Georgia | 30.7 |
| Alburg, Vt. | 3.6 | Milton | 37.3 |
| East Alburg... | 8.7 | Winnski | 50.2 |
| Swanton | 16.0 | Burlington..... | 52.9 |
| St. Albans..... | 24.7 | | |



PENNSYLVANIA ROUTES

NEW YORK-PHILADELPHIA.

New York-Atlantic City.

| Miles | Miles |
|-------------------------|--------------------------|
| New York..... 0.0 | Avon..... 68.7 |
| Newark..... 8.9 | Belmont..... 67.4 |
| Elizabeth..... 15.1 | Spring Lake..... 69.0 |
| Rahway..... 20.7 | Seagirt..... 70.7 |
| Perth Amboy..... 28.3 | Manaquan..... 71.7 |
| South Amboy..... 32.3 | Brielle..... 72.7 |
| Keyport..... 38.3 | Pt. Pleasant..... 74.3 |
| Middletown..... 44.4 | Burrville..... 78.7 |
| Red Bank..... 49.3 | Lakewood..... 84.0 |
| Shrewsbury..... 51.3 | Toms River..... 94.0 |
| Katontown..... 52.8 | Bayville..... 98.4 |
| Long Branch..... 57.4 | Barnegat..... 110.4 |
| West End..... 59.0 | Manahawken..... 115.2 |
| Elberon..... 60.7 | Tuckerton..... 122.9 |
| Deal..... 62.1 | New Gretna..... 129.6 |
| Allenhurst..... 63.1 | Port Republic..... 136.3 |
| Asbury Park..... 64.3 | Oceanville..... 140.7 |
| Ocean Grove..... 65.3 | Absecon..... 144.2 |
| Bradley Beach..... 65.7 | Atlantic City..... 153.3 |

Atlantic City-Cape May.

| Miles | Miles |
|------------------------|-------------------------|
| Atlantic City..... 0.0 | Ocean View..... 26.8 |
| Pleasantville..... 5.3 | Cape May C. H..... 35.6 |
| Ocean City..... 14.9 | Rio Grande..... 41.5 |
| Seaville..... 24.6 | Cape May..... 48.1 |

Cape May-Philadelphia.

| Miles | Miles |
|-------------------------|-------------------------|
| Cape May..... 0.0 | Franklinville..... 62.4 |
| Cape May C. H..... 13.1 | Clayton..... 65.0 |
| Dennisville..... 22.0 | Glassboro..... 67.7 |
| Eldora..... 27.0 | Hurville..... 72.3 |
| Leesburg..... 32.2 | Westville..... 80.0 |
| Mauricetown..... 37.3 | Gloucester..... 80.9 |
| Milville..... 46.8 | Camden..... 85.5 |
| Vineland..... 53.3 | Philadelphia..... 85.5 |

OPTIONAL.

New York City-Atlantic City, N. J.

| Miles | Miles |
|--------------------------|--------------------------|
| New York City..... 0.0 | Adelphia..... 41.2 |
| St. George..... 0.3 | Lakewood..... 50.4 |
| Tompkinsville..... 0.6 | Tom's River..... 60.1 |
| Stapleton..... 1.3 | Bayville..... 64.4 |
| New Dorp..... 6.0 | Lanoka..... 67.2 |
| Gifford..... 8.6 | Forked River..... 69.4 |
| Anandale..... 10.6 | Waretown..... 73.0 |
| Huguenot..... 11.3 | Barnegat..... 76.2 |
| Princes Bay..... 11.9 | Manahawken..... 80.5 |
| Pleasant Pt's..... 12.7 | Cedar Run..... 81.5 |
| Tottenville..... 14.8 | Mayetta..... 82.1 |
| P. Amboy, N. J..... 15.5 | West Creek..... 85.5 |
| South Amboy..... 18.7 | Parkertown..... 86.2 |
| Morgan..... 21.3 | Tuckerton..... 88.4 |
| Keyport..... 24.7 | New Gretna..... 94.5 |
| Matawan..... 26.6 | Port Republic..... 101.0 |
| Freneau..... 27.9 | Smithville..... 103.6 |
| Morganville..... 29.5 | Oceanville..... 105.4 |
| Wickatunk..... 31.3 | Absecon..... 109.3 |
| Marlboro..... 33.8 | Pleasantville..... 111.8 |
| Freehold..... 37.8 | Atlantic City..... 118.3 |

New York City-Easton, Pa.

| Miles | Miles |
|-----------------------------|------------------------|
| New York City..... 0.0 | Far Hills..... 39.5 |
| (Ferry to Weehawken, N. J.) | Pedminster..... 40.3 |
| Union Hill..... 0.8 | Lamington..... 44.6 |
| Jersey City..... 5.1 | White House..... 48.6 |
| Newark..... 11.6 | Anandale..... 56.0 |
| Irrington..... 15.1 | Clinton..... 57.7 |
| Springfield..... 19.4 | Glen Gardner..... 62.4 |
| Summit..... 22.5 | Hampton..... 63.4 |
| West Summit..... 24.2 | Washington..... 68.1 |
| New Providence..... 25.3 | Broadway..... 72.1 |
| Berk'y Heights..... 27.7 | New Village..... 74.2 |
| W. Millington..... 33.2 | Phillipsburg..... 80.6 |
| Liberty Corner..... 35.6 | Easton..... 81.1 |

New York City-Philadelphia.

(Via Lincoln Highway.)

| Miles | Miles |
|-----------------------------|---------------------------|
| New York City..... 0.0 | Franklin Park..... 41.7 |
| (Ferry to Weehawken, N. J.) | Kingston..... 48.4 |
| Jersey City..... 5.2 | Princeton..... 51.3 |
| Newark..... 11.8 | Lawrenceville..... 56.5 |
| Elizabeth..... 17.3 | Trenton..... 62.7 |
| Roselle..... 20.0 | Oxford Val., Pa..... 69.4 |
| Rahway..... 23.7 | Langhorne..... 72.2 |
| Iselin..... 27.2 | Bustleton..... 80.9 |
| Metuchen..... 29.7 | Oxford Circle..... 83.4 |
| New Brunswick..... 35.2 | Philadelphia..... 92.1 |

Philadelphia-Gettysburg, Pa.

| Miles | Miles |
|--------------------------|------------------------|
| Philadelphia..... 0.0 | Vintage..... 53.1 |
| Ardmore..... 9.2 | Williamstown..... 54.6 |
| Bryn Mawr..... 11.0 | Paradise..... 55.6 |
| Wayne..... 15.0 | Soudersburg..... 57.3 |
| Stafford..... 15.6 | Lancaster..... 65.5 |
| Berwyn..... 18.0 | Mountville..... 72.1 |
| Paoli..... 20.4 | Columbia..... 76.2 |
| Exton..... 27.8 | Wrightsville..... 77.7 |
| Whitford..... 29.2 | Hallam..... 82.1 |
| R. Downingtown..... 32.5 | Stony Brook..... 84.6 |
| Downington..... 33.1 | York..... 89.4 |
| Thorndale..... 35.4 | Thomasville..... 96.5 |
| Coatesville..... 39.3 | Farmers..... 99.8 |
| Sadsburyville..... 43.0 | Abbebtown..... 104.3 |
| Gap..... 50.1 | New Oxford..... 108.4 |
| Kinners..... 52.3 | Gettysburg..... 118.2 |

Gettysburg, Pa.-Washington, D. C.

| Miles | Miles |
|--------------------------|--------------------------|
| Gettysburg..... 0.0 | Ridgeville..... 48.1 |
| Emmitsburg, Md..... 10.5 | Damascus..... 54.1 |
| Thurmont..... 18.3 | Cedar Grove..... 58.1 |
| Lewistown..... 21.5 | Galtersburg..... 66.1 |
| Hannsville..... 25.0 | Rockville..... 71.0 |
| Harmony Grove..... 31.3 | Tennallytown..... 81.4 |
| Frederick..... 34.2 | Wash'ton, D. C..... 87.5 |
| New Market..... 32.1 | |

Scranton-Delaware Water Gap, Pa.

| Miles | Miles |
|----------------------|--------------------------|
| Scranton..... 0.0 | Scot-Run..... 36.3 |
| Elmhurst..... 9.0 | Tannersville..... 38.0 |
| Moscow..... 12.3 | Bartonsville..... 41.3 |
| Dalesville..... 14.6 | Stroudsburg..... 46.8 |
| Tohyhanna..... 25.9 | E. Stroudsburg..... 47.2 |
| Mt. Pocono..... 31.6 | Delaware W. G..... 51.3 |
| Swiftwater..... 34.0 | |

Erie-Pittsburgh, Pa.

| Miles | Miles |
|-------------------------|--------------------------|
| Erie..... 0.0 | Portersville..... 93.2 |
| Cam. Springs..... 26.0 | Mid. Lancaster..... 99.0 |
| Vernango..... 29.9 | Harmony..... 102.6 |
| Saegertown..... 34.2 | Zellanople..... 104.3 |
| Meadville..... 40.7 | Brush Creek..... 114.7 |
| Custer..... 49.0 | Wexford..... 116.8 |
| Sheakleyville..... 55.8 | Perryville..... 124.3 |
| Mercer..... 71.0 | Westview..... 125.8 |
| Leesburg..... 77.7 | Pittsburgh..... 133.4 |
| Harlausburg..... 85.6 | |

Pittsburgh-Uniontown, Pa.

| Miles | Miles |
|------------------------|-----------------------|
| Pittsburgh..... 0.0 | Kenneth..... 36.6 |
| Clairton..... 16.6 | Brownsville..... 40.4 |
| W. Elizabeth..... 18.4 | Davidson..... 43.6 |
| Elizabeth..... 18.8 | Brier Hill..... 44.6 |
| Hill Dale..... 20.6 | Searights..... 47.0 |
| Fayette City..... 33.2 | Uniontown..... 52.4 |
| Gillespie..... 34.5 | |

WilkesBarre-Philadelphia, Pa.

| Miles | Miles |
|--------------------------|----------------------------|
| WilkesBarre..... 0.0 | Nazareth..... 65.1 |
| Ashville Plains..... 5.2 | Bethlehem..... 74.7 |
| Fairview..... 6.7 | Coopersburg..... 83.0 |
| Bear Creek..... 16.7 | Quakertown..... 89.1 |
| Stoddardsville..... 25.9 | Sellersville..... 95.6 |
| Blakeslee..... 28.0 | Montgomeryville..... 104.8 |
| Pocono..... 32.3 | Springhouse..... 109.4 |

| | |
|--------------------------|----------------------------|
| Effort..... 42.1 | Ambler..... 111.7 |
| Broadheadville..... 44.8 | Nat. Cemetery..... 120.4 |
| Saylorsburg..... 50.8 | N. Philadelphia..... 125.4 |
| Windgap..... 55.8 | Philadelphia..... 128.4 |
| Belfast..... 60.1 | |

Mercer-Pittsburgh, Pa.

| Miles | Miles |
|-------------------------|-----------------------|
| Mercer..... 0.0 | Hannastown..... 41.1 |
| Blackstown..... 5.4 | Saxonbury..... 45.0 |
| Leesburg..... 7.3 | Cumberville..... 52.5 |
| Grove City..... 7.5 | Dorseyville..... 56.8 |
| North Liberty..... 12.1 | Undercliff..... 63.3 |
| Slippery Rock..... 14.0 | Sharpsburg..... 64.5 |
| Butler..... 32.2 | Pittsburgh..... 70.9 |

Bedford-Pittsburgh, Pa.

| Miles | Miles |
|------------------------|-------------------------|
| Bedford..... 0.0 | Long Bridge..... 51.6 |
| Wolfsburg..... 2.6 | Youngstown..... 56.3 |
| Schellburg..... 9.3 | Greensburg..... 68.5 |
| Buckstown..... 22.5 | Grapeville..... 70.8 |
| Kanter..... 27.5 | Adamsburg..... 72.9 |
| Stoyestown..... 28.6 | Irwin..... 76.3 |
| Farrellton..... 34.7 | Jacksonville..... 77.1 |
| Jenner..... 35.2 | Circleville..... 77.7 |
| Jennersville..... 36.3 | E. McKeesport..... 83.4 |
| Laughlontown..... 44.7 | Pittsburgh..... 97.7 |
| Ligonier..... 47.7 | |

Pittsburgh-Washington, Pa.

| Miles | Miles |
|-----------------------|------------------------|
| Pittsburgh..... 0.0 | Houston..... 21.4 |
| Heidelberg..... 8.3 | McGovern..... 31.2 |
| Woodville..... 9.3 | Meadow Lands..... 24.5 |
| Bridgeville..... 10.7 | Washington..... 29.0 |
| Canonsburg..... 19.5 | |

Washington, Pa.-Cumberland, Md.

| Miles | Miles |
|--------------------------|---------------------------|
| Washington..... 0.0 | Hopwood..... 34.5 |
| S. Strabane..... 5.1 | Mt. Washington..... 46.5 |
| Glyre..... 6.7 | Farmington..... 47.9 |
| Odell..... 9.0 | Thomas..... 59.9 |
| Hillaboro..... 12.0 | Somerfield..... 58.4 |
| Beallville..... 15.0 | Addison..... 61.8 |
| Centerville..... 17.8 | Keyser's R., Md..... 68.1 |
| Malden..... 20.7 | Grantville..... 73.7 |
| W. Brownsville..... 23.1 | Frostburg..... 85.0 |
| Brownsville..... 23.5 | Eckhart..... 89.3 |
| Brier Hill..... 28.0 | Clarysville..... 90.5 |
| Uniontown..... 34.6 | Cumberland..... 99.0 |

Cumberland-Hagerstown, Md.

| Miles | Miles |
|----------------------|-------------------------|
| Cumberland..... 0.0 | Indian Spring..... 49.5 |
| Flintstone..... 12.9 | Clear Spring..... 54.9 |
| Gilpin..... 14.0 | Wilson..... 58.1 |
| Hancock..... 38.3 | Hagerstown..... 65.3 |
| Millstone..... 44.2 | |

Cumberland, Pa.-Wheeling, W. Va.

| Miles | Miles |
|------------------------|---------------------------|
| Cumberland..... 0.0 | Summit..... 56.0 |
| Frostburg..... 11.0 | Uniontown..... 62.0 |
| Grantville..... 25.0 | Brownsville..... 74.0 |
| Keyser Ridge..... 31.0 | Scenery Hill..... 86.9 |
| Addison..... 36.0 | Washington..... 99.0 |
| Somerfield..... 40.0 | Clayville..... 109.0 |
| Farmington..... 50.0 | Wheel'g, W. Va..... 132.6 |

Wheeling, W. Va.-Pittsburgh, Pa.

| Miles | Miles |
|--------------------------|-----------------------|
| Wheeling..... 0.0 | Morgansa..... 43.2 |
| Claysville, Pa..... 23.0 | Bridgeville..... 50.8 |
| Washington..... 33.0 | Carnegie..... 54.8 |
| Cannonsburg..... 41.2 | Pittsburgh..... 62.1 |

Washington, D. C.-Richmond Va.

| Miles | Miles |
|--------------------------|--------------------------|
| Washington..... 0.0 | Spottsylvania..... 75.8 |
| Accotink, Va..... 19.3 | Snell..... 80.0 |
| Lorton..... 23.5 | Partlow..... 90.7 |
| Ocoquan..... 27.0 | Chilesburg..... 94.6 |
| Dumfries..... 37.6 | Teman Station..... 100.6 |
| Garrisonville..... 48.3 | Oliver..... 116.3 |
| Falmouth..... 63.0 | Ashland..... 119.1 |
| Fredericksburg..... 64.4 | Richmond..... 135.7 |



Richmond, Va.-Raleigh, N. C.

| Miles | Miles |
|-----------------------|--------------------------|
| Richmond..... 0.0 | Clarksville..... 110.7 |
| Manchester..... 2.0 | Soudan..... 116.2 |
| Petersburg..... 22.4 | Bullock, N. C..... 122.0 |
| Dinwiddie..... 37.8 | Stovall..... 125.3 |
| Butterworth Sta. 40.7 | Lewis..... 130.5 |
| Dewitt Station. 42.3 | Oxford..... 135.0 |
| Cochran..... 64.5 | Franklinston..... 156.5 |
| South Hill..... 80.4 | Youngville..... 164.1 |
| Banksville Sta. 91.0 | Wake Forest..... 168.3 |
| Antler's Station 94.8 | Raleigh..... 184.6 |
| Boydton..... 99.7 | |

New York City-Delaware Water Gap, Pa.

| Miles | Miles |
|-----------------------------|-----------------------|
| New York City 0.0 | Chester..... 44.6 |
| (Ferry to Weehawken, N. J.) | German Valley 49.1 |
| North Bergen... 1.4 | Schooley's Mt'n 51.7 |
| Jersey City.... 5.2 | Hackettstown... 55.8 |
| Newark..... 11.8 | Vienna..... 59.8 |
| Irvington..... 15.8 | Great Meadows. 61.0 |
| Vaux Hall..... 18.4 | Buttsville..... 68.4 |
| Springfield... 20.2 | Bridgeville..... 70.4 |
| Chatham..... 24.8 | Delaware..... 74.3 |
| Madison..... 27.0 | Portland, Pa.... 77.5 |
| Morristown.... 31.7 | Slateford..... 79.3 |
| Mendham..... 38.7 | Del. Water Gap 82.9 |

Binghamton, N. Y.-Scranton, Pa.

| Miles | Miles |
|----------------------|-----------------------|
| Binghamton..... 0.0 | Nicholson..... 43.0 |
| Langdon..... 6.7 | Factoryville.... 48.1 |
| Kirkwood..... 8.8 | La Plume..... 49.9 |
| Great Bend, Pa. 14.3 | Dalton..... 51.8 |
| Hallstead..... 14.9 | Glenburn..... 53.0 |
| New Milford... 20.9 | Clark's Summit. 55.2 |
| Heart Lake.... 25.5 | Chinchilla..... 57.2 |
| Brooklyn..... 33.3 | Scranton..... 62.0 |
| Pester..... 37.2 | |

Port Chester, N. Y.-Newark, N. J.

| Miles | Miles |
|---------------------|--------------------|
| Port Chester... 0.0 | Hilldale..... 26.5 |
| White Plains.. 6.3 | Westwood..... 27.4 |
| Elmsford..... 9.7 | Emerson..... 28.5 |
| Tarrytown..... 13.0 | Oradelle..... 30.3 |

| | |
|----------------------|----------------------|
| Nyack..... 13.9 | River Edge..... 31.3 |
| West Nyack.... 16.4 | Hackensack..... 35.2 |
| Nauet..... 19.4 | Woodbridge..... 39.5 |
| Pearl River.... 22.2 | Carlstadt..... 40.2 |
| Montvale, N. J. 23.6 | Rutherford..... 41.1 |
| Park Ridge.... 24.4 | Lyndhurst..... 42.3 |
| Woodcliff Lake 25.2 | Newark..... 49.3 |

Elmira, N. Y.-Scranton, Pa.

| Miles | Miles |
|----------------------|-----------------------|
| Elmira..... 0.0 | Sugar Run..... 57.2 |
| Lowman..... 6.7 | Hollenbeck..... 60.6 |
| Chemung..... 12.8 | Jenningsville. 68.9 |
| Waverly..... 17.3 | Mahopany..... 75.2 |
| Snyre, Pa..... 20.1 | Eatonville..... 83.8 |
| Athens..... 22.0 | Tunkhannock... 85.9 |
| Green's Land'g. 24.2 | La Grange..... 91.1 |
| Millan..... 25.9 | Lake Wynola... 93.5 |
| Ulster..... 30.3 | Mill City..... 95.9 |
| North Towaunda 37.0 | Shultsville.... 100.9 |
| Towanda..... 38.6 | Clarke Summit. 104.7 |
| Wysox..... 41.4 | Chinchilla..... 106.9 |
| Durrell..... 45.8 | Providence..... 110.0 |
| Terrytown.... 53.4 | Scranton..... 112.7 |

Elmira, N. Y.-Wilkes-Barre, Pa.

| Miles | Miles |
|----------------------|-----------------------|
| Elmira..... 0.0 | Laceyville..... 63.6 |
| Wellburg..... 6.9 | Meshoppen..... 71.0 |
| Chemung..... 14.1 | Russell Hill... 74.7 |
| Waverly..... 18.6 | Tunkhannock... 80.0 |
| Athens, Pa.... 22.2 | Peterboro..... 88.5 |
| Ulster..... 30.3 | Bowman Creek. 91.4 |
| Towanda..... 38.4 | Beaumont..... 93.5 |
| Wysox..... 41.0 | Kunkle..... 95.9 |
| Standing Stone. 45.2 | Dallas Station. 99.1 |
| Rummerfeld... 48.1 | Luzerne..... 105.5 |
| Wyalusing.... 55.2 | Wilkes-Barre... 108.6 |

Port Jervis, N. Y.-Easton, Pa.

| Miles | Miles |
|---------------------|----------------------|
| Port Jervis.... 0.0 | Portland..... 44.9 |
| Milford, Pa.... 7.0 | Mt. Bethel..... 46.4 |
| Dingman's F'y. 15.6 | Stone Church... 49.2 |
| Egypt Mills... 24.0 | Richmond..... 51.0 |
| Bushkill..... 27.4 | Mt. Pleasant... 53.9 |
| Shawnee..... 36.3 | Martin's Creek. 56.1 |
| N. Water Gap.. 38.3 | Sundt's Eddy... 58.0 |
| Del. Water Gap 39.5 | Easton..... 63.8 |
| Slateford..... 43.1 | |

Philadelphia, Pa.-Washington, D. C.

| Miles | Miles |
|---------------------|------------------------|
| Philadelphia... 0.0 | Aberdeen..... 70.5 |
| Darby..... 8.2 | Churchville.... 76.9 |
| Norwood..... 11.1 | Bel Air..... 82.3 |
| Chester..... 15.6 | Kingville..... 89.8 |
| Marcus Hook... 19.6 | Perry Hall..... 92.8 |
| Wilm'ton, Del. 28.4 | Overlea..... 98.4 |
| Elsmere June'n 31.3 | Baltimore..... 103.6 |
| Marshallton... 34.1 | Elkridge..... 114.1 |
| Newark Center 41.7 | Laurel..... 125.1 |
| Newark..... 42.3 | Muirkirk..... 128.8 |
| Elkton, Md.... 48.9 | Ammendale..... 129.9 |
| Northeast..... 55.1 | Beltsville..... 131.0 |
| Charlestown... 58.1 | Hyattsville.... 137.4 |
| Principio..... 61.6 | Bladensburg... 138.2 |
| Perryville.... 64.3 | Wash'gton, D. C. 143.3 |
| Harv' De Grace 65.2 | |

Philadelphia-Easton, Pa.

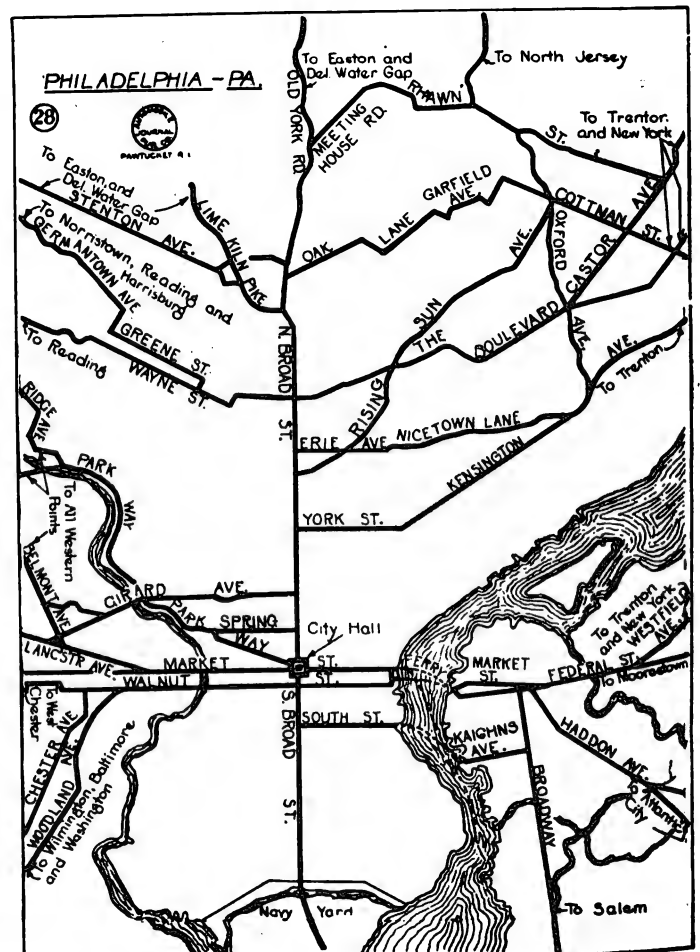
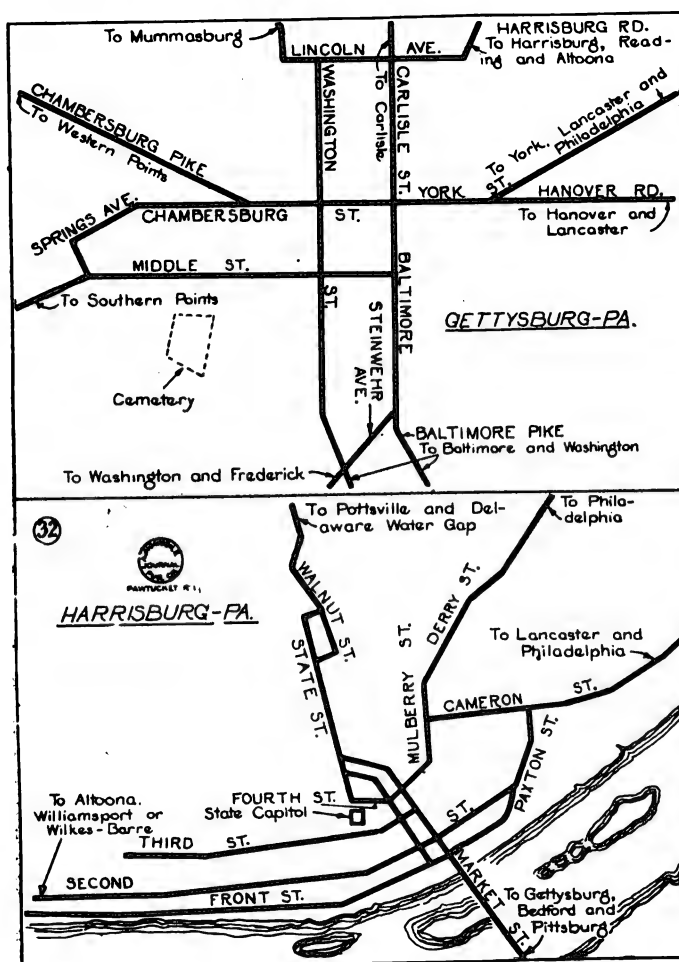
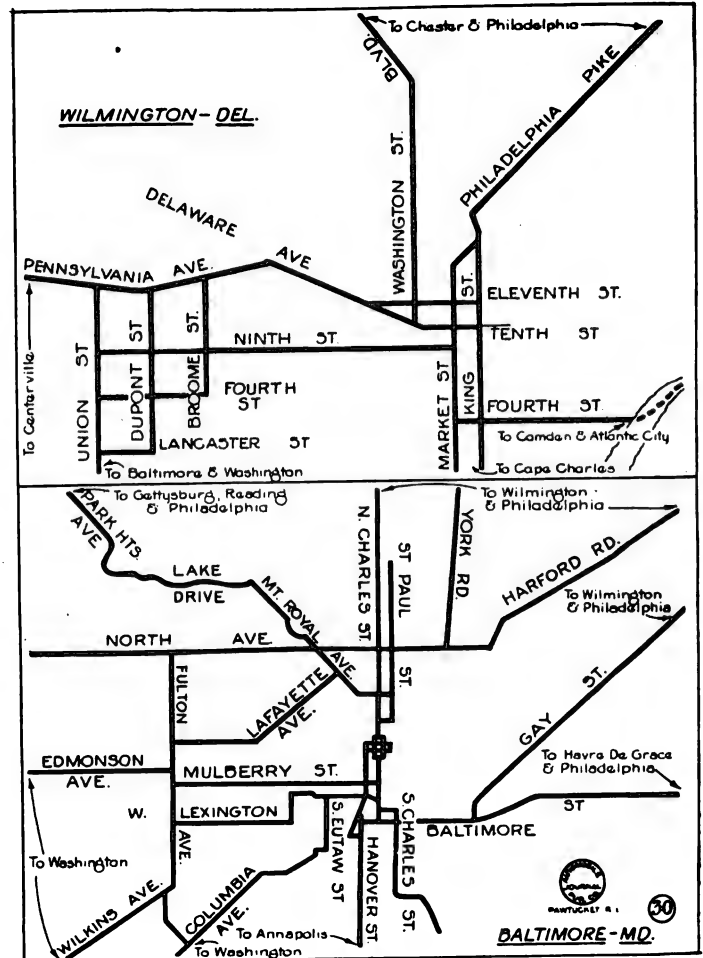
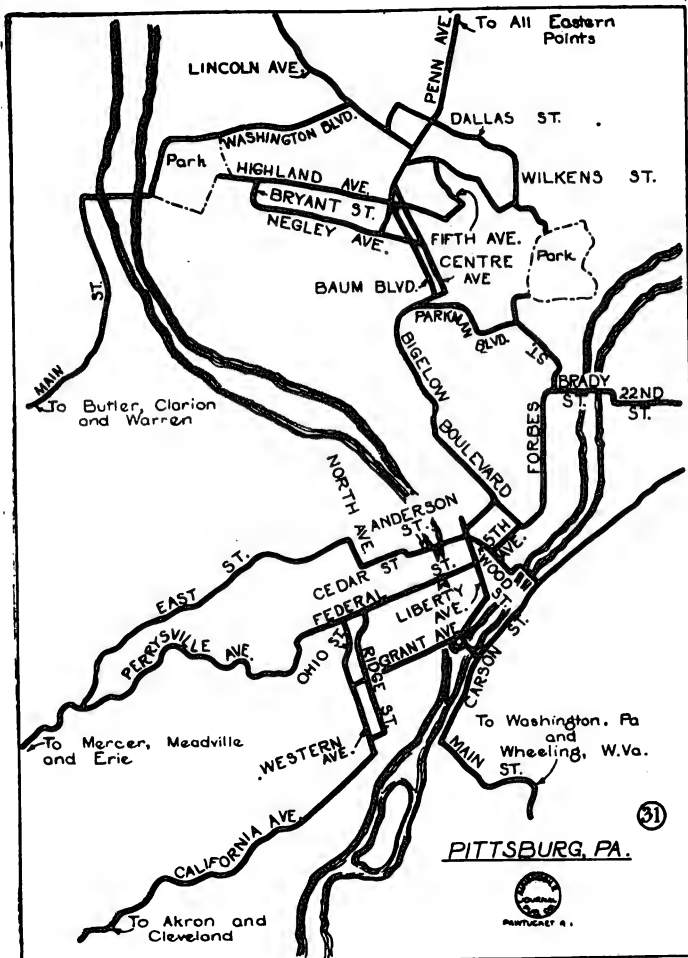
| Miles | Miles |
|---------------------|----------------------|
| Philadelphia... 0.0 | Piperville..... 34.8 |
| Ogonts..... 8.6 | Ottaville..... 38.3 |
| Jenkintown... 10.4 | The Harrows... 40.1 |
| Arlington..... 11.5 | Revere..... 41.9 |
| Willow Grove.. 13.8 | Ferradale..... 43.4 |
| Warrington... 21.8 | Kintnersville.. 45.3 |
| Turk..... 24.5 | Lehensburg.... 46.9 |
| Doylestown... 26.1 | Riegelsville... 48.5 |
| Danboro..... 29.3 | Raubsville.... 52.0 |
| Plumsteadville 31.8 | Easton..... 57.6 |

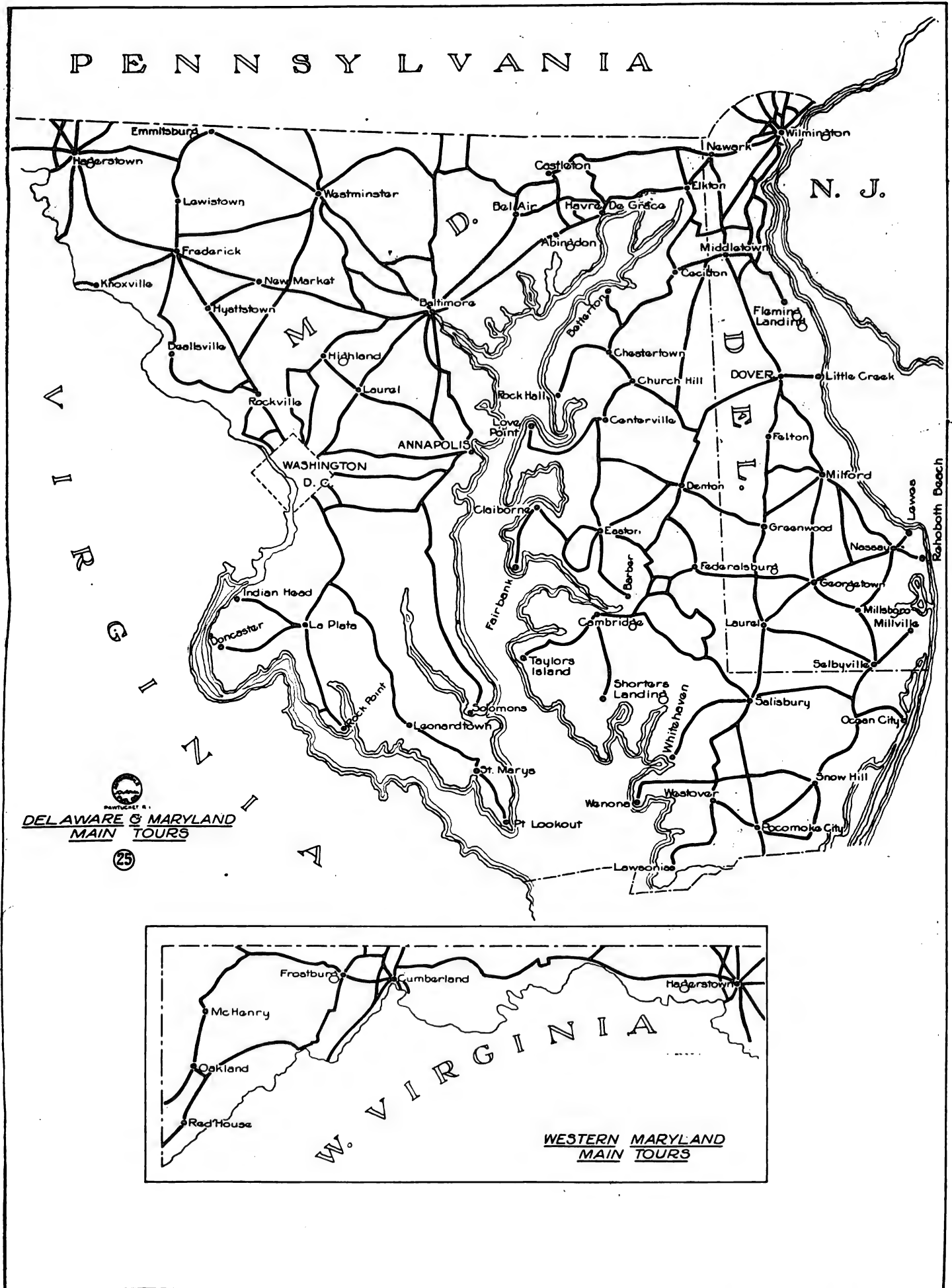
Philadelphia-Phoenixville, Pa.

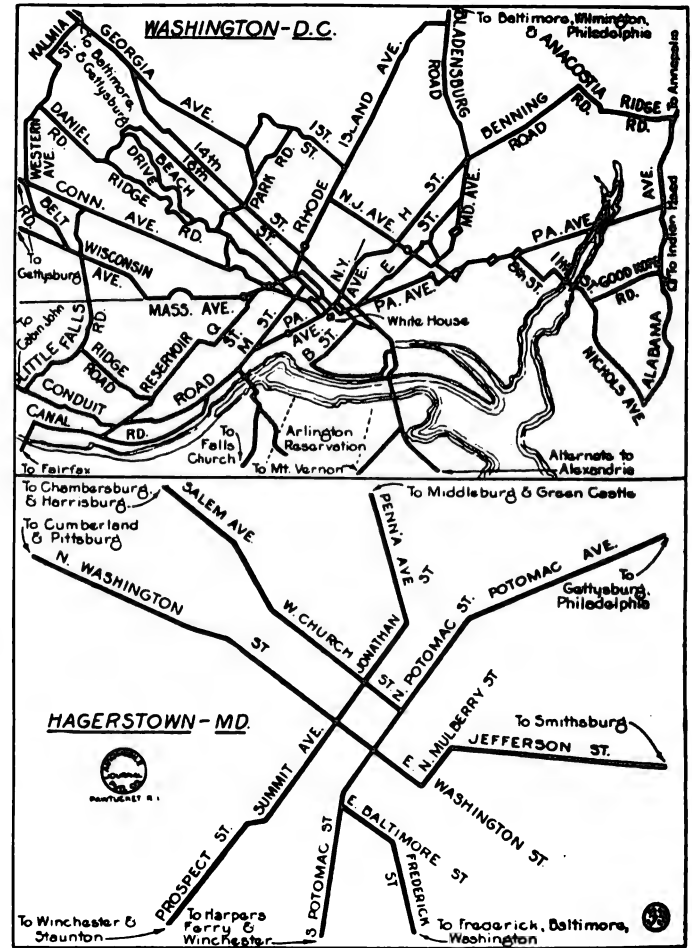
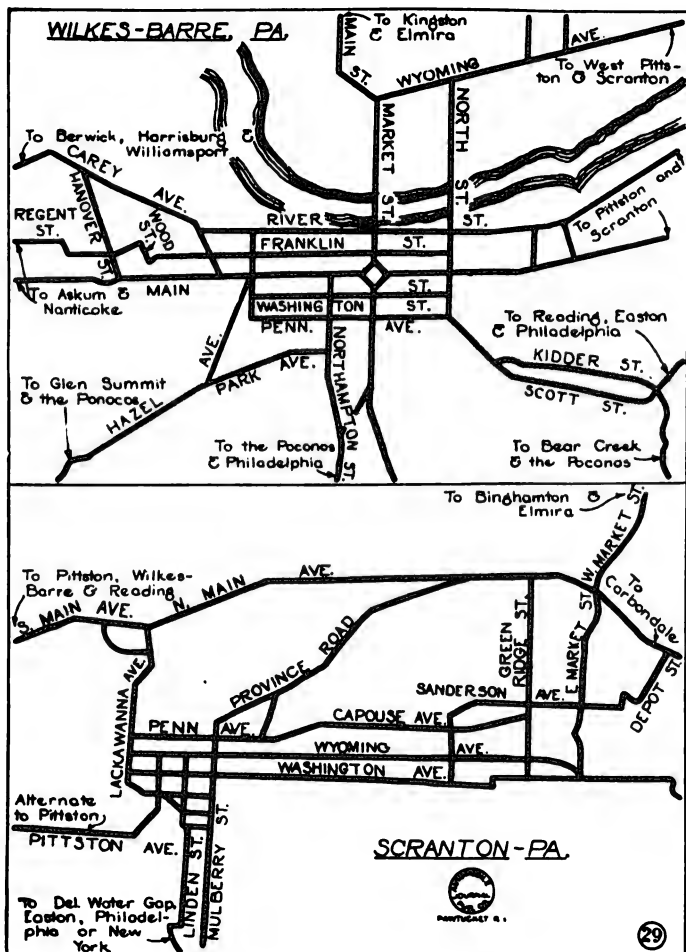
| Miles | Miles |
|---------------------|------------------------|
| Philadelphia... 0.0 | Jeffersonville... 19.1 |
| Fairmount Pk. 1.0 | Audubon..... 22.4 |
| Wissahickon... 5.9 | Oaks..... 23.4 |
| Barren Hill... 11.4 | Port Providence 25.8 |
| Harmonville... 13.4 | Montclare.... 26.6 |
| Norristown... 16.7 | Phoenixville... 27.1 |

Philadelphia-Reading, Pa.

| Miles | Miles |
|----------------------|----------------------|
| Philadelphia... 0.0 | Pottstown..... 39.3 |
| Barren Hill... 13.7 | Douglasville... 43.8 |
| Fairview..... 22.9 | Reading..... 56.4 |
| Collegeville... 27.2 | |







Reading-Harrisburg, Pa.

| Miles | Miles |
|----------------------|-----------------------|
| Reading..... 0.0 | Lebanon..... 28.3 |
| Robesonia..... 12.0 | Palmyra..... 37.4 |
| Womelsdorf..... 14.5 | Hershey..... 40.7 |
| Waterloo..... 17.3 | Swatara..... 41.5 |
| Myerstown..... 21.3 | Hummelstown..... 44.0 |
| Avon..... 28.1 | Harrisburg..... 53.4 |

Harrisburg-Gettysburg, Pa.

| Miles | Miles |
|-----------------------|------------------------|
| Harrisburg..... 0.0 | Clear Spring..... 17.0 |
| Camp Hill..... 3.3 | York Springs..... 23.3 |
| Shepardstown..... 9.3 | Heidlersburg..... 27.5 |
| Dillsburg..... 14.6 | Gettysburg..... 37.0 |

Gettysburg-Bedford, Pa.

| Miles | Miles |
|---------------------------|--------------------------|
| Gettysburg..... 0.0 | Fort Loudon..... 28.0 |
| Seven Stars..... 3.8 | McConnellsburg..... 45.9 |
| McKnightstown..... 5.8 | Harrisburg..... 52.3 |
| Cashtown..... 7.7 | Mellvaines..... 63.7 |
| Black Gap..... 15.7 | Breeseville..... 63.7 |
| Fayetteville..... 18.3 | Everett..... 72.0 |
| W. Fayetteville..... 19.8 | The Willows..... 76.7 |
| Chambersburg..... 24.5 | Bedford..... 80.0 |
| St. Thomas..... 32.0 | |

Gettysburg, Pa.-Staunton, Va.

| Miles | Miles |
|---------------------|-----------------------|
| Gettysburg..... 0.0 | Strassburg..... 105.3 |

| | |
|---------------------------|--------------------------|
| Fairfield..... 8.1 | Tom's Brook..... 111.0 |
| Charman Sta'n..... 15.2 | Maurertown..... 112.5 |
| Rounsville..... 18.5 | Woodstock..... 116.4 |
| Waynesboro..... 21.6 | Edinburg..... 121.8 |
| Leitersburg..... 27.0 | New Market..... 129.3 |
| Hagerstown..... 33.3 | Newmarket..... 129.7 |
| Tilghamantown..... 41.5 | Lacey Springs..... 145.5 |
| Antietam B'f'ds..... 45.8 | Harrisonburg..... 153.9 |
| Sharpsburg..... 47.3 | Mt. Crawford..... 161.9 |
| Antietam Sta'n..... 48.7 | Burkstown..... 164.7 |
| Shep't'n, W. Va..... 50.9 | Mt. Sydney..... 169.7 |
| Halltown Sta'n..... 59.8 | Willow Spout..... 171.7 |
| Charlestown..... 63.5 | Verona..... 174.0 |
| Berryville, Va..... 76.3 | Staunton..... 180.9 |
| Winchester..... 86.9 | |

CANADIAN TOURS

ITINERARIES.

Portland-Augusta, Me., 64.8 Miles.

| Miles | Miles |
|----------------------------|----------------------|
| Portland, Me..... 0.0 | Auburn..... 33.5 |
| Merrill's Corn'r..... 3.1 | Lewiston..... 33.9 |
| Allen's Corner..... 4.0 | Greene..... 41.9 |
| Gray..... 17.1 | Winthrop..... 54.4 |
| North Gray..... 19.5 | Manchester..... 60.3 |
| Upper Gloucester..... 24.8 | Augusta..... 64.8 |

Augusta-Lake Parlin, Me., 97 Miles.

| Miles | Miles |
|----------------------|-------------------|
| Augusta, Me..... 0.0 | Solon..... 50.1 |
| Waterville..... 19.6 | Bingham..... 58.6 |

| | |
|-------------------------|-----------------------|
| Fairfield Cen..... 23.7 | Carratunk..... 73.9 |
| Skowhegan..... 36.0 | The Forks..... 81.3 |
| Lakewood..... 41.7 | Lake Parlin..... 97.0 |

Lake Parlin, Me.-Quebec, P. Q., 121 Miles.

| Miles | Miles |
|--------------------------|---------------------------|
| Lake P'lin, Me..... 0.0 | Des Plantes..... 71.4 |
| Jackman..... 12.7 | St. Joseph..... 77.8 |
| Moose River..... 14.2 | Beauce Junction..... 83.1 |
| Line House..... 28.4 | St. Marie..... 90.1 |
| Armstr'g, P. Q..... 39.4 | Scott Junction..... 95.2 |
| Jersey..... 56.1 | St. Henri..... 109.9 |
| St. George..... 58.0 | Levis-Que. Fer..... 120.6 |
| Gilbert..... 65.0 | Quebec..... 121.0 |
| Beauceville..... 97.9 | |

Quebec-Montreal, P. Q., 176.7 Miles.

| Miles | Miles |
|---------------------------------|-------------------------|
| Quebec, P. Q..... 0.0 | Three Rivers..... 79.6 |
| St. Augustin..... 14.3 | Pointe du Lac..... 88.7 |
| Les Escureux..... 28.5 | Yamachiche..... 97.0 |
| Cap Sante..... 32.7 | Maskinonge..... 111.1 |
| Portneuf..... 37.8 | Berthier..... 125.3 |
| Deschambault..... 42.0 | Lanoraie..... 134.5 |
| La Chevrotiere..... 46.8 | Lavaltrie..... 140.6 |
| Grondines..... 49.1 | St. Sulpice..... 146.3 |
| St. Anne de la Parade..... 57.9 | L'Assomption..... 151.5 |
| Champlain..... 66.0 | Charlemagne..... 160.2 |
| C'p de la M'tine..... 75.7 | Montreal..... 176.7 |

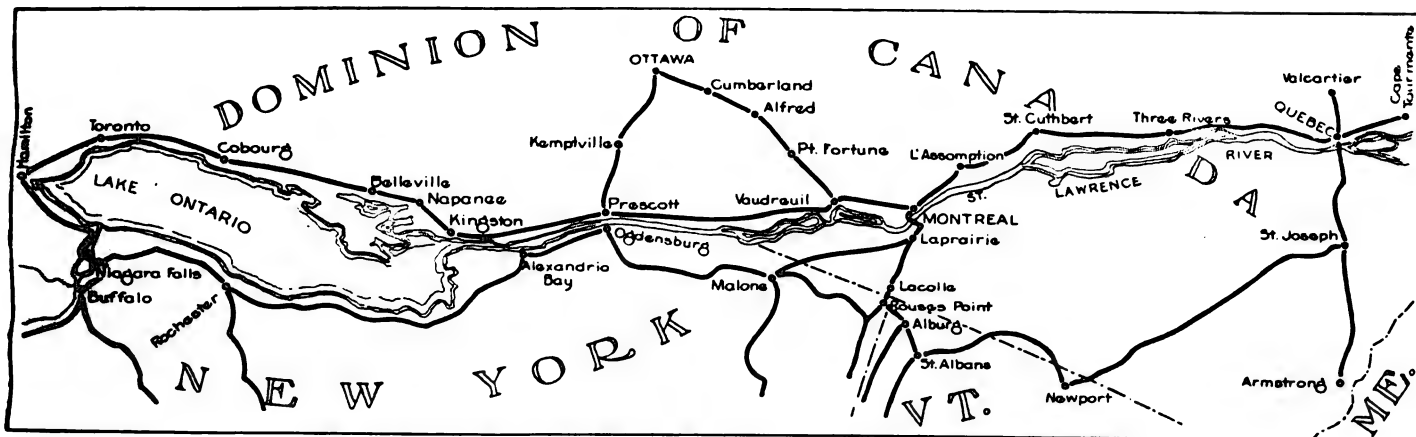


Chart of Route Encircling Lake Ontario and the Upper St. Lawrence Valley.

Newport, Vt.-Quebec, P. Q., 177.8 Miles.

| Miles | Miles |
|-----------------------|-----------------------|
| Newport, Vt. 0.0 | Coleraine 97.5 |
| Derby 5.1 | Thetford Mines 108.2 |
| Stanstead, P. Q. 11.0 | Robertson Sta. 113.4 |
| Cassville 17.1 | Reedham 115.3 |
| Massawippi 29.5 | Kinnear's Mills 123.8 |
| Lennoxville 39.7 | Leeds 130.0 |
| Ascot 55.2 | Parkhurst 139.8 |
| S. Dudswell 57.4 | St. Gilles 148.4 |
| Marbleton 66.8 | St. Etienne 160.3 |
| Weeden 75.7 | Chaudiere 165.6 |
| Garthby 86.6 | Levis 173.5 |
| D'Iracl. 91.7 | Quebec 177.8 |

Montreal-Ottawa, Can.

| Miles | Miles |
|----------------------|------------------|
| Montreal 0.0 | Hawkesbury 61.9 |
| St. Laurent 6.9 | Lorignal 65.0 |
| Borde a Plouffe 11.0 | Cassburn 67.5 |
| St. Martin 12.6 | Alfred 77.5 |
| St. Eustace 20.5 | Plantagenet 84.5 |
| St. Benoit 31.8 | Wendover 90.5 |
| St. Placide 38.2 | Clarence 96.0 |
| St. Andrew's E. 46.6 | Rockland 98.5 |
| Carrillon (Fry) 48.9 | Cumberland 103.5 |
| Point Fortune 49.0 | Orleans 110.5 |
| Little Rideau 54.2 | Ottawa 121.0 |

Montreal, P. Q.-Kingston, Ont.

| Miles | Miles |
|--------------|------------------|
| Montreal 0.0 | Morrisburg 107.1 |
| Lachine 7.4 | Iroquois 115.1 |

| | |
|-------------------------------|-------------------|
| St. Anne's (Fry) 23.1 | Cardinal 120.5 |
| Iale Perrot (m'land Fry) 30.5 | Prescott 130.0 |
| Cascade Point 33.1 | Brockville 142.2 |
| Lancaster 63.4 | Lyn Village 148.5 |
| Corawall 80.2 | Gannoque 175.8 |
| Aultville 98.2 | Kingston 194.4 |

Kingston-Toronto, Ont.

| Miles | Miles |
|-------------------|-------------------|
| Kingston 0.0 | Coborg 93.8 |
| Catarqui 3.6 | Port Hope 101.2 |
| Napanee 25.5 | Bowmanville 122.8 |
| Marysville 33.9 | Oshawa 132.2 |
| Shannonville 40.6 | Whitby 136.4 |
| Belleville 49.4 | Pickering 142.5 |
| Trenton 60.7 | Toronto 165.0 |
| Colborne 78.4 | |

Toronto-Hamilton, Ont.

| Miles | Miles |
|----------------------|----------------|
| Toronto 0.0 | Freeman 38.8 |
| Cookville 16.3 | Aldershot 41.6 |
| Trafalgar Vill. 24.7 | Hamilton 47.0 |
| Appleby 35.0 | |

Calais, Me.-St. John, N. B., 81.9 Miles.

| Miles | Miles |
|----------------------|---------------------|
| Calais, Me. 0.0 | Musquash 64.3 |
| St. Steph. N. B. 0.4 | Spruce L. Sta. 74.0 |
| Oak Bay 7.0 | Fairville 78.9 |
| St. George 35.8 | St. John 81.0 |
| Lepreux 55.7 | |

Houlton, Me.-Woodstock, N. B., 14.7 Miles.

| Miles | Miles |
|-------------------|-----------------------|
| Houlton, Me. 0.0 | Woodstock, N. B. 14.7 |
| Richmond Cor. 7.8 | |

Woodstock-Fredericton, N. B., 63.4 Miles.

| Miles | Miles |
|----------------------|---------------------|
| Woodstock, N. B. 0.0 | Prince William 41.5 |
| Meductic 12.8 | Hammondville 47.2 |
| Hawshaw 26.3 | Fredericton 63.4 |

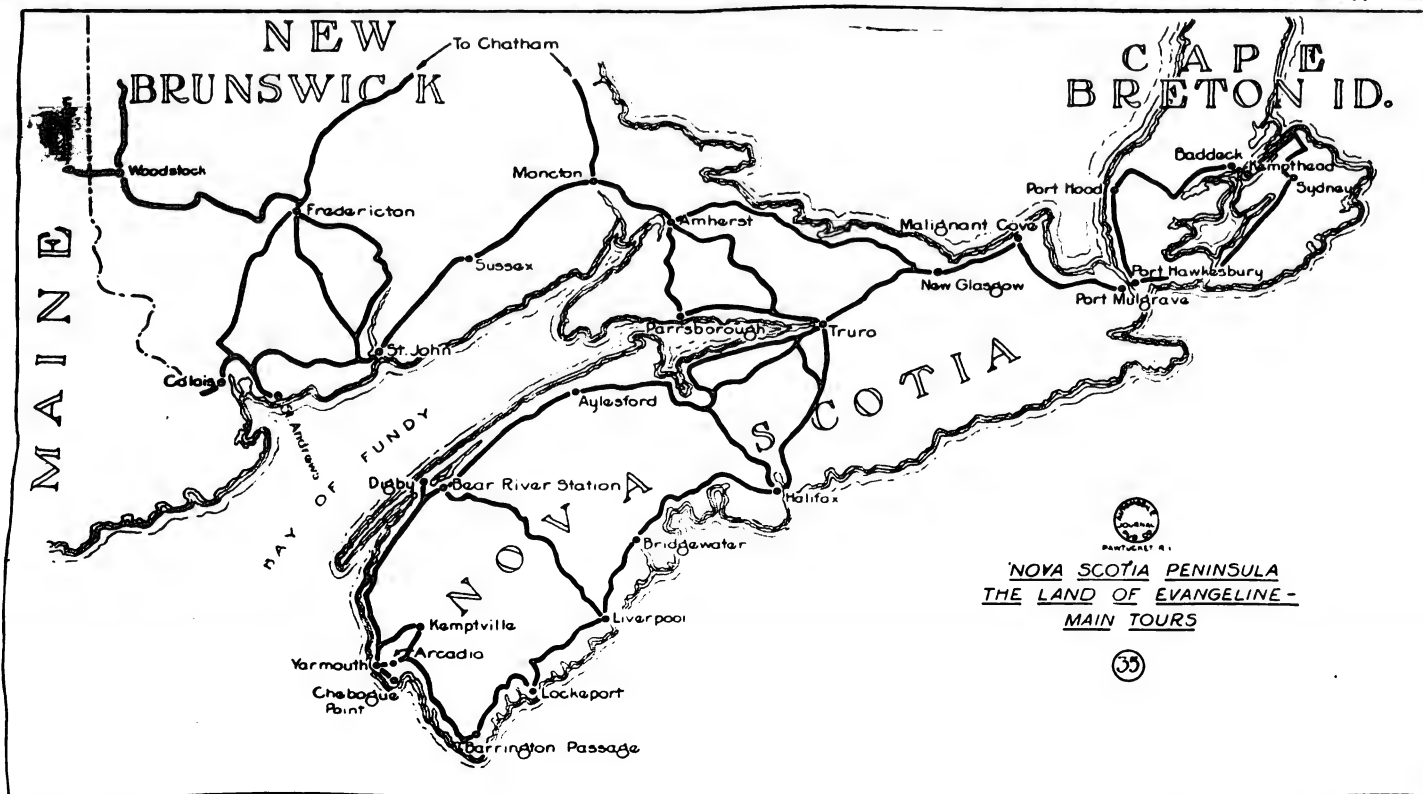
St. John-Fredericton, N. B., 66.6 Miles.

(Via the Broad Road.)

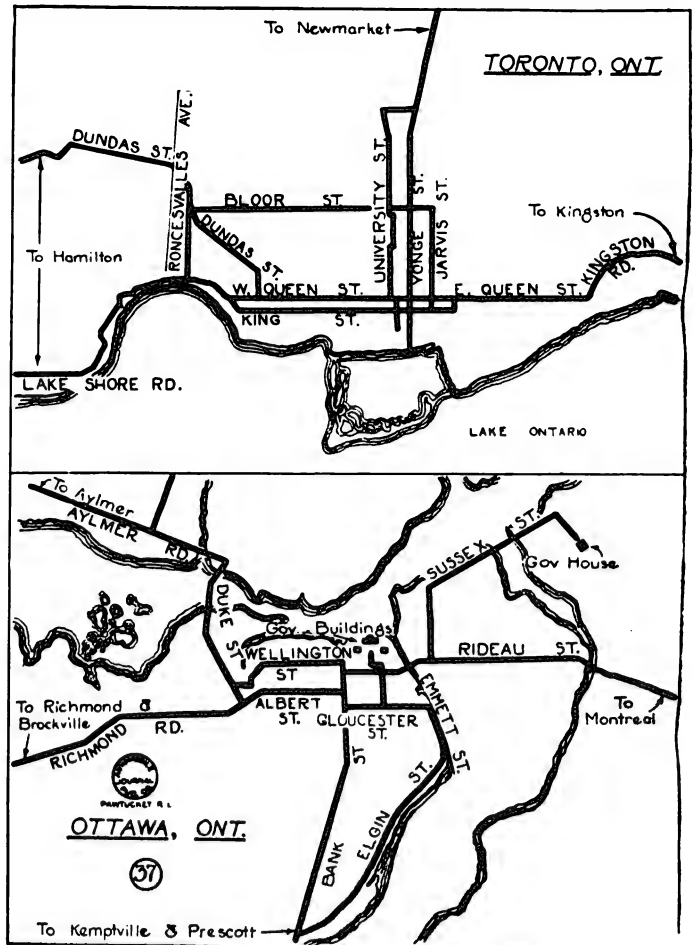
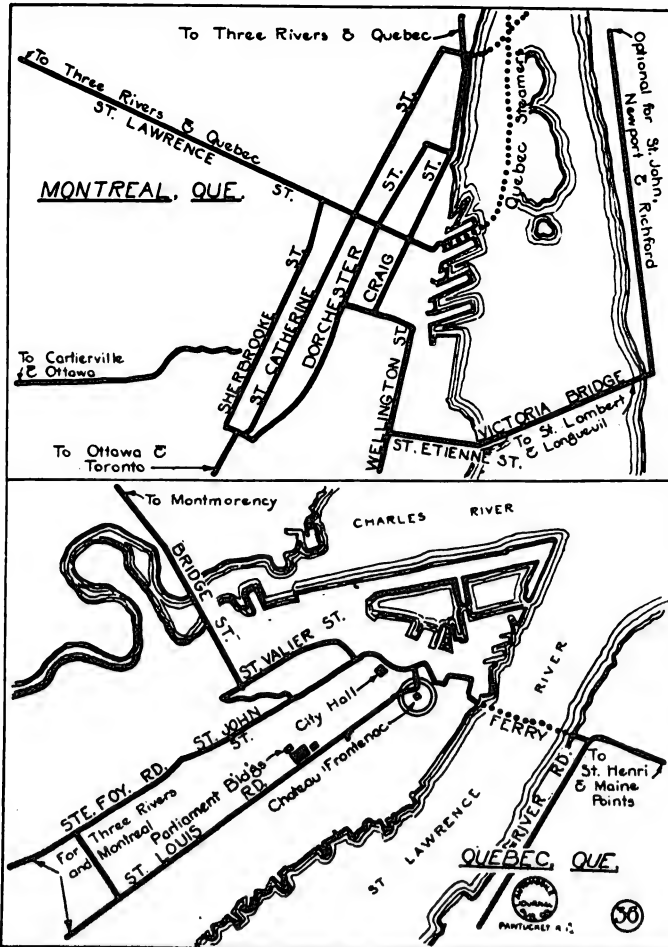
| Miles | Miles |
|---------------------|------------------|
| St. John, N. B. 0.0 | Welsford 24.7 |
| Fairville 2.9 | Petersville 33.2 |
| Grand Bay 10.5 | Oromocto 54.2 |
| Westfield B'ch 14.5 | Fredericton 66.6 |

St. John, N. B.-Amherst, N. S., 132.8 Miles.

| Miles | Miles |
|---------------------|---------------------|
| St. John, N. B. 0.0 | Pettitcodiac 68.7 |
| Brookeville 4.7 | River Glade 73.9 |
| Terburn Sta. 5.8 | Salisbury 78.8 |
| Riverside Sta. 7.4 | Boundary Creek 82.1 |
| Rothsay 8.9 | Moncton 92.8 |
| Nauwigewauk 17.0 | St. Anselme 96.8 |
| Lakeside Sta. 20.9 | Memramcook 104.3 |



NOVA SCOTIA PENINSULA
THE LAND OF EVANGELINE -
MAIN TOURS



| | | | |
|-----------------|------|------------------------|-------|
| Hampton | 22.2 | Up. Dorchester | 111.4 |
| Norton | 33.5 | Dorchester | 114.5 |
| Apohaqui | 40.0 | Sackville | 123.6 |
| Sussex | 45.0 | Au Lac Sta., N.S. | 127.4 |
| Monopolus | 53.5 | Amherst | 132.8 |

Amherst-Truro, N. S., 74.9 Miles. (Via Wentworth Valley.)

| | Miles | | Miles |
|----------------------|-------|--------------------|-------|
| Amherst, N. S. . | 0.0 | Glenholme. | 61.0 |
| Oxford. | 22.1 | Masstown. | 64.3 |
| South Victoria. 32.5 | | Lower Onslow. | 68.3 |
| Wentworth. | 41.4 | Truro. | 74.9 |
| Folleigh Sta. . | 50.3 | | |

Amherst-New Glasgow, N. S., 97.2 Miles.

| | Miles | | Miles |
|-------------------------|-------|-----------------------|-------|
| Amherst | 0.0 | Tatamagouch | 53.2 |
| Truemanville | 6.9 | Brule | 60.0 |
| Head of Amh't. | 12.2 | River John | 65.9 |
| Port Howe | 25.4 | Poplar Hill | 74.6 |
| Pugwash | 30.4 | Meadowville | 76.0 |
| Wallace Bay | 36.6 | Scotburn | 81.5 |
| Head of Wal. B. | 38.5 | Durham | 85.1 |
| Wallace | 40.7 | Alma | 90.5 |
| Wallace Ridge | 44.5 | New Glasgow | 97.2 |

Amherst-Truro, N. S., 92.4 Miles. (Via Parrsboro.)

| | Miles | | Miles |
|----------------|-------|---------------|-------|
| Amherst, N. S. | 0.0 | Lower Economy | 53.6 |

| | |
|-----------------------|------|
| Nappan Station | 6.4 |
| Maccan | 9.9 |
| Athol | 13.8 |
| Westbrook | 23.2 |
| Parrsboro | 35.5 |
| Moose River | 43.8 |
| Low. Five Isl's | 47.6 |
| Five Islands | 50.7 |

Truro-New Glasgow, N. S., 40.6 Miles.

| | Miles | | Miles |
|--------------------|-------|--------------------|-------|
| Truro, N. S. . . . | 0.0 | Green Hill | 31.3 |
| Kempton | 12.9 | Alma | 33.9 |
| Salt Spring . . . | 24.9 | New Glasgow . . . | 40.6 |

Truro-Halifax, N. S., 65 Miles.

| | Miles | | Miles |
|--------------------|-------|-------------------|-------|
| Truro, N. S. . . . | 0.0 | Elmsdale. | 34.3 |
| Hilden. | 4.9 | Enfield. | 36.8 |
| Brookfield. . . . | 8.7 | Wellington. . . . | 43.7 |
| Brentwood. . . . | 11.0 | Waverly. | 50.3 |
| Alton. | 13.7 | Bedford. | 55.7 |
| Stewiacke. . . . | 18.8 | Rockingham. . . . | 60.9 |
| Shubenacadie. . . | 23.4 | Halifax. | 65.0 |

Halifax-Digby, N. S., 152 Miles.

| | Miles | | Miles |
|-----------------|-------|-----------------|-------|
| Halifax, N. S.. | 0.0 | Waterville..... | 79.5 |
| Rockingham .. | 4.2 | Berwick..... | 83.0 |

| | |
|---------------------|------|
| Economy | 57.7 |
| Bass River | 64.9 |
| Portapique | 68.2 |
| Great Village | 74.8 |
| Glenholme | 78.2 |
| Masstown | 81.1 |
| Lower Onslow | 85.8 |
| Truro | 92.4 |

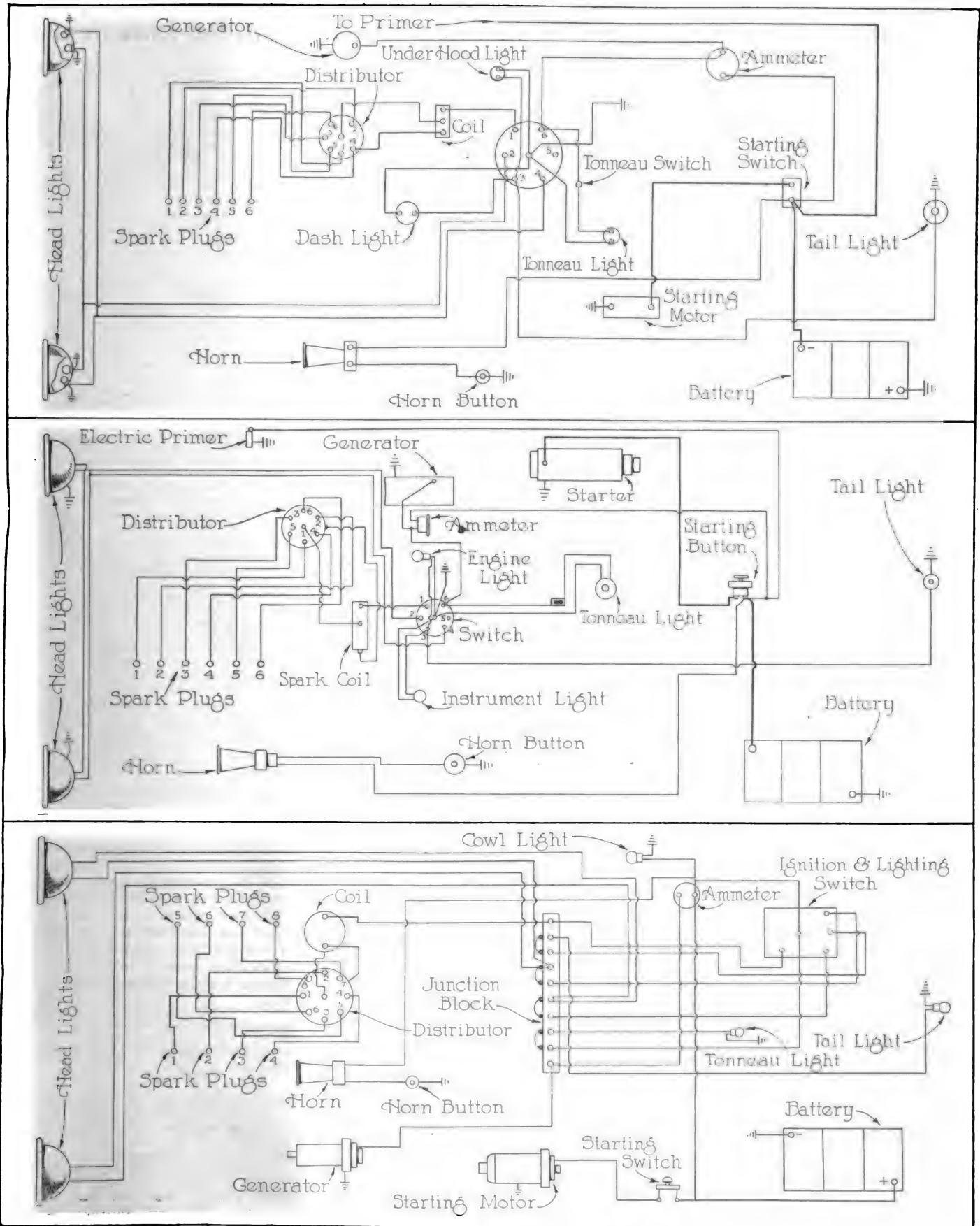
| | | | |
|--|------|-----------------------|-------|
| Bedford | 9.3 | Aylsford | 88.2 |
| Sackville | 13.0 | Auburn | 90.1 |
| Mt. Uniacke | 25.3 | Kingston | 94.6 |
| Newport Cor. | 35.4 | Wilmot | 99.4 |
| St. Croix | 38.5 | Middleton | 101.7 |
| Newport Sta. | 39.6 | Lawrencetown | 108.0 |
| Windsor | 45.2 | Paradise | 110.8 |
| Huntsport | 52.3 | Bridgetown | 115.6 |
| Grand Pre | 60.3 | Tupperville | 120.9 |
| (Road from here goes to Evangeline Beach and other interesting places) | | Round Hill | 123.9 |
| Wolfville | 63.0 | Annapolis Roy'l | 130.6 |
| Kentville | 70.5 | Clementsport | 138.7 |
| Coldbrook | 75.1 | Deep Brook | 141.7 |
| Cambridge | 77.8 | Bear River | 144.9 |
| | | Smith's Cove | 145.7 |
| | | Digby | 152.0 |

Digby-Yarmouth, N. S., 66.5 Miles.

| | Miles | | Miles |
|-----------------------|-------|---------------------------|-------|
| Digby, N. S. | 0.0 | Saultnierville. | 34.1 |
| Barton. | 9.0 | Low, Saultville | 35.2 |
| Plympton | 12.0 | Meteghan River | 37.0 |
| Gilbert Cove. | 13.9 | Meteghan. | 39.5 |
| Ashmore | 15.8 | Mavillette. | 46.2 |
| Weymouth N. | 18.1 | Salmon River. | 48.9 |
| Weymouth | 19.9 | Beaver River | 53.4 |
| Belliveau | 24.6 | Port Maitland. | 55.0 |
| Church Point. | 28.3 | Hebron | 62.4 |
| Little Brook. | 31.0 | Yarmouth. | 66.5 |
| Comenauville. | 32.0 | | |



Monthly Wiring Diagram, No. 18



Top, 1920 National Sixtet; Center, 1921 National Sixtet, Westinghouse Starting and Lighting System; Bottom, 1921 Apperson Eight, Bijur System.

Automotive Groups Organized

Motor and Accessory Manufacturers Association Inaugurates Plan of Far Reaching Significance to Automotive Industry.

THE new group plan of the Motor and Accessory Manufacturers' association is now under way following the organization of the Sheet Metal Manufacturers as the first industrial unit.

At a meeting just held at Detroit, representatives of several of the principal sheet metal manufacturers doing business with the automotive industry voted unanimously to organize the sheet metal group of the Motor and Accessory Manufacturers' association, in accordance with the organization plan approved by the board of directors and recently promulgated by M. L. Heminway, general manager of the association.

Under this arrangement the 400 companies now affiliated with the Motor and Accessory Manufacturers' association will be divided into a number of groups, each of which will comprise manufacturers of the same products, and each of which will have officers and meetings of its own, but for general purposes affiliated with the parent organization.

In a special bulletin to the members of the association it was announced that "the board of directors and general manager of your association believe the time has arrived for expanding the scope of its services and policies to meet more fully the specific needs of the specialized classes of its membership." Following the preliminary announcement of the plan, members almost without dissent enthusiastically indorsed the programme.

"We believe," continued the bulletin, "that under this plan the industry and the public it serves will be materially benefitted. Approximately 400 manufacturers are now members of the Motor and Accessory Manufacturers' association. The establishment and centralization of these groups, based on the classification of the products they manufacture, will make for a greater unity of purpose in the direction of economies of production and distribution, thus eliminating duplication of effort and expense.

"Furthermore, through joint committee work with the Society of Automotive Engineers and the National Automobile Chamber of Commerce and other engineering and trade bodies, the work of

these groups will become increasingly effective."

It is one of the requirements that all members of the group must be members of the Motor and Accessory Manufacturers' association.

The Sheet Metal group has elected the following officers of its executive committee: Chairman, H. P. Carrow, Hayes Manufacturing Co., Detroit, Mich.; vice chairman, C. V. Hale, Saginaw Sheet Metal Works, Saginaw, Mich.; secretary-treasurer, E. H. Scott, W. N. Johnson Sheet Metal Works, Richmond, Ind.

Other Groups to Be Organized.

Plans are now under way for the early organization of several other groups in the association, including units for the following divisions, among others:

1. Asbestos Products.
2. Axles.
3. Bearings.
4. Bumpers.
5. Carburetors.
6. Chains.
7. Clutches.
8. Engines.
9. Fans.
10. Forgings.
11. Foundries.
12. Gears.
13. Lamps.
14. Piston Rings.
15. Radiators.
16. Sheet and Pressed Metals.
17. Shock Absorbers.
18. Spark Plugs.
19. Springs.
20. Startings, Lightings and Ignitions.
21. Steel Producers.
22. Steel Products.
23. Tires and Tubes.
24. Tops.
25. Transmissions.
26. Warning Signals.
27. Wheels.
28. Windshields.

The actual classification of products is only tentative and subject to revision upon advices from members and action by the board of directors.

Activities and Functions.

The activities and functions of all groups to be organized under this plan are:

1. Discussion of subjects of interest and value to the particular division or branch of the industry in which the members of the group are engaged.

2. The advancement and improvement of the entire industry and the particular division thereof represented by the members of the group.

3. The collection and dissemination of statistics and information of value to the members of the group.

4. Such standardization of mechanical equipment, production methods and commercial practises as may be deemed desirable or essential to advance the interests of the particular branch of the industry represented by the group. Following are some of the subjects suggested for standardization:

Design, purchasing specifications, construction, materials, cost systems, specifications, weight, dimensions, sales contract forms, packing, shipping, invoicing forms, guarantees, advertising, service methods and other activities not specifically named, if approved by the board of directors after written request presented by the chairman of the group; such request to be signed by at least two-thirds of the representatives of the member companies forming such groups.

5. The promotion of a spirit of friendly aid and mutual cooperation within the group, and also with other groups in the industry by inaugurating rules designed to eliminate wasteful practises attendant upon multiplicity of models, types and styles, and the promotion of other economies and improvements of general benefit, tending to eliminate extravagant methods of production and distribution.

6. Other activities not specifically named herein, if approved by the board of directors of the Motor and Accessory Manufacturers' association, upon written request presented by the chairman of a particular group; such request to be signed by at least two-thirds of the representative members.

All of the above activities are to be carried on within the limitations imposed by the federal and state laws, and under the advice and guidance of the general counsel of the Motor and Accessory Manufacturers' association.

Advisory Committee.

A significant feature of the plan is an arrangement whereby the chairman of all groups constitute an advisory committee to the executive committee of the board of directors of the association and an advisory board to the general manager of the association. The president, first vice president, secretary and general manager and general counsel of the association are ex-officio members of all groups.

SPRING MANUFACTURERS FORM M. & M. A. GROUP.

A group of spring manufacturers has been formally organized in the Motor and Accessory Manufacturers' association, being the second industrial unit in the new inter-group plan recently put into operation.

At a meeting held in Cleveland last week the Leaf Spring Institute, consisting of more than 10 representative spring manufacturers, decided to dissolve the institution and transfer as a unit to the

Motor and Accessory Manufacturers' association.

M. L. Heminway, general manager of the association, made this announcement:

The executive committee in charge of the Leaf Spring group consists of H. R. McMahon, president of the Standard Steel Spring Co., Coraopolis, Pa., chairman; Mason Rumney, secretary Detroit Steel Products Co., Detroit, Mich., vice chairman; E. B. Busby, secretary William & Harvey Rowland, Inc., Philadelphia, Pa., secretary and treasurer.

Leading concerns in the field already

affiliated, or about to join, include the following:

American Auto Parts Co., Detroit, Mich.; Sheldon Axle Co., Wilkes Barre, Pa.; Liggett Spring & Axle Co., Monongahela, Pa.; Standard Parts Co., Cleveland, O.; Alloy Steel Spring Co., Jackson, Mich.; Detroit Steel Products Co., Detroit, Mich.; Standard Steel Spring Co., Coraopolis, Pa.; William & Harvey Rowland, Inc., Philadelphia, Pa.; Iron City Spring Co., Pittsburgh, Pa.

All members of the group must be members of the parent association.



Hopwood to Brownfield Road, Fayette Co., Pa., built with "Tarvia-X" penetration method in 1917.

A substantial Slag Road built with Tarvia—

The photographs show two sections of the Hopwood to Brownfield Road, South Union Township, Fayette County, Pa.

This road was built over an old water-bound base by the Township Supervisors with their own forces. A five-inch course of Dunbar Bank slag was used as road metal. The slag was bound with "Tarvia-X" applied by the penetration method. A deferred "Tarvia-B" seal coat was applied two months after completion.

This is now a mighty fine piece of road that is proof against heavy traffic. With occasional

Tarvia maintenance, it ought to last for many years, forming a mudless, dustless, automobile-proof highway of which any community might well be proud.

This is just another example of the fact that no matter what sort of a road problem town or highway officials encounter, they can turn to Tarvia with the comfortable knowledge that there is a grade and a method of application of this versatile coal-tar preparation to help them out.

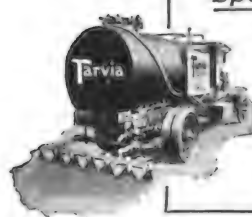
Illustrated booklets, describing the various Tarvia treatments, sent free on request.



Tarvia makes hill-roads waterproof and prevents the surface from washing away.

Tarvia

*For Road Construction
Repair and Maintenance*



Special Service Department

This company has a corps of trained engineers and chemists who have given years of study to modern road problems. The advice of these men may be had for the asking by anyone interested. If you will write to the nearest office regarding road problems and conditions in your vicinity, the matter will be given prompt attention.

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Detroit
Salt Lake City
Johnstown
Elizabethtown

Chicago
New Orleans
Seattle
Lebanon
Buffalo

Philadelphia
Birmingham
Peoria
Youngstown
Baltimore

Boston
Kansas City
Atlanta
Toledo
Omaha

The *Barrett* Company

Montreal

Toronto

Winnipeg

Vancouver

St. Louis
Minneapolis
Duluth
Columbus
Jacksonville

St. John, N. B.

Cleveland
Dallas
Milwaukee
Richmond
Houston

Halifax, N. S.

Cincinnati
Nashville
Bangor
Latrobe
Denver

Pittsburgh
Syracuse
Washington
Bethlehem

(When Writing to Advertisers, Please Mention the Automobile Journal.)

METHOD OF MAKING PHOSPHOR BRONZE.

Phosphorous in its pure state is combined with the metallic alloy to form phosphor bronze. The phosphorous is purchased in sticks about as thick as the finger and weighing about two ounces each. One or more of these sticks of phosphorous are introduced into a short tube made of clay or graphite. This tube is attached to the end of a metal rod and strips of tin or copper that are fastened over the end. The tube is plunged into the molten metal and held there until the phosphorous has been absorbed. Another plan is to use an iron cylinder at the end of a long handle. Several sticks of phosphorous are inserted in the cylinder, which is then lowered into the molten metal and allowed to remain until the phosphorous has been absorbed.

Inasmuch as pure phosphorous ignites at a low temperature, it is a dangerous material to handle. Consequently the sticks of phosphorous are often coated with a deposit of copper. This is done by placing the sticks of phosphorous in a dilute solution of sulphate of copper for about one-half hour. The deposit of copper on the outside surface of the stick keeps the air from contact with the phosphorous and the stick may be safely handled so long as the copper is not broken. The coating is thin so that it does not hinder the absorption of the phosphorous when the stick is plunged into the molten metal.

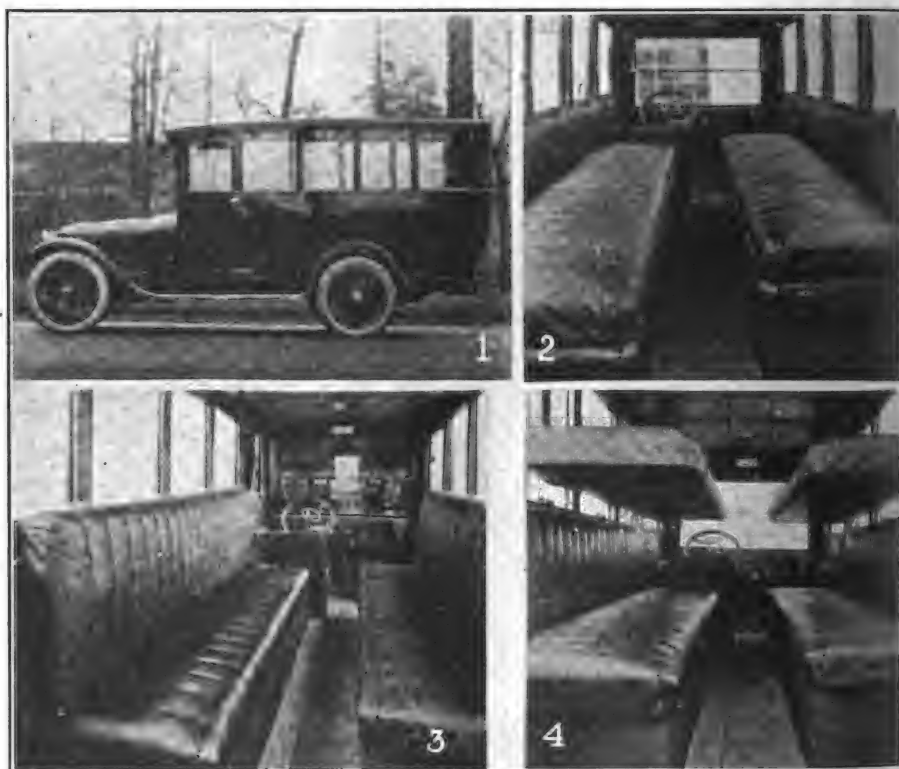
DEAD BLACK ON BRASS INSTRUMENTS.

Place about a thimbleful of lamp black on a smooth surface of glass or porcelain, drop four or five drops of gold size on it and thoroughly incorporate the same with a spatula. It should form a stiff paste. Use as little of the size as possible as an excess will give the coating a glossy instead of the desired dead finish. Add about double the volume of turpentine, mix with a camel's hair brush and apply to the surface.

BODY DESIGNED FOR FISHING TRIPS.

While the Knightstown Buggy Co., Knightstown, Ind., specializes on the manufacture of funeral cars, it does not confine its production to this one line by any

ing quarters. A single bucket seat is provided for the driver, a rear door with steps and two front side doors, each fitted with roll-up curtains and plate glass panels arranged in such a manner that the glass drops into pockets in the doors.



Fishing De Luxe with the Knightstown Company's Special Body Equipment—No. 1 Shows Complete Job from Outside; No. 2, Interior View with Two Extra Spring Cushions in Place on Each Side; No. 3 Shows Two Extra Cushions, Forming Backs for the Seats for Day Service; No. 4 Shows Two Extra Cushions in Position for Sleeping Berths.

means. For example, there is shown, herewith, a body arrangement that may be attached to a three-quarter or 1½-ton chassis, and makes a special appeal to fishermen or other sportsmen.

This type of special body may be used for other general touring and camping purposes if the owner wishes, as the fittings provide for carrying several passengers in addition to cooking and sleep-

The rear of the body is provided with a small space for kitchenette, stove, ice box, locker, etc. Double cushions are fitted to the seats, running lengthwise of the body, which, in the day time, are used as backs for the seats and at night are raised and fitted to overhead supports, forming additional sleeping quarters for members of the party who may be special transient guests.

TRADE OUTLET

TANKS FOR SALE

New and used in all parts of the country. Over 10,000 tanks of all sizes and kinds and for any use.

NEW 1,000 gallon standard New York City, ¼" steel gasoline storage, f. o. b. N. Y. \$110.00

Same tank 3/16" with ¼" heads... 99.00

550 gallons, ¼" tank as above... 62.00

550 gallons, 3/16" tank as above... 59.00

We make lowest price on new tanks of any character anywhere.

Chemical and Mechanical Equipment.

LARGEST DEALERS IN TANKS.

Curtiss-Willis Company, Inc.
30 Church Street, New York City.

AUTO SAVE 50-90% FOR 400 CARS PARTS

POPE, PACKARDS, PIERCE, BUICK, STEVENS-DURYEA, KNOX, OVERLAND, ETC.

| | | | |
|--------------|------------|-----------------|-----------|
| Motors, | \$25.00 up | Presto Tanks, | \$4.50 up |
| Magnetos, | 4.00 up | New Spotlights, | 2.00 up |
| Carburetors, | 8.00 up | Generators, | 10.00 up |
| Rear Axles, | 15.00 up | Gears, | 1.00 up |
| Front Axles, | 5.00 up | Bearings, | 1.00 up |
| Cylinders, | 5.00 up | Radiators, | 10.00 up |

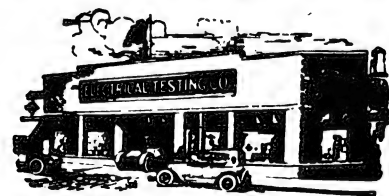
\$12 Diamond Bumpers.....\$5.50
Jobbers in Bankrupt Auto Supplies.

BRIGHTMAN AUTO EXCHANGE

321 Windsor Ave., Hartford, Conn.

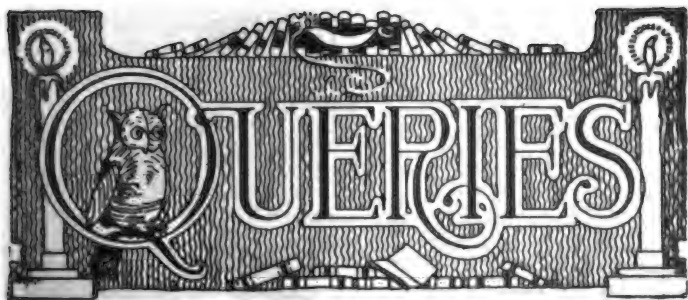
Send Your Repair Work to Specialists.

We Are Experts in
STARTING, LIGHTING, IGNITION.



303 Knoxville Avenue,
Peoria, Illinois.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

**RADIATOR STEAMS.**

(Mrs. J. B., Portland, Me.)

My engine boils the water after running three miles, although I have had the car taken to a local garage and the repairer reports that the pump, fan and circulation are correct. Will this boiling do any harm, and how can it be prevented?

Boiling of the water, in itself, is not necessarily harmful, although it may prevent the engine from developing its best power, but the danger is that the water may so far boil away that circulation will stop, and then overheating and serious damage to the engine may result. We believe that the garage repairer may have overlooked some unit of the circulation that may still be causing the trouble. If the rubber connections are old and soft so that they are easily pinched by the thumb and forefinger, you had better renew them, as they are probably soft inside and will restrict the passage of the water. If the radiator has not been cleaned out in some time you had better have this done with washing soda dissolved in hot water and placed in the system after the water has been drained. Running the engine for a short time will allow the rust and sediment to be dissolved, after which the solution is drained and the radiator filled with fresh water after being thoroughly rinsed with cold water several times. Make sure that your brakes are not dragging, check up the spark timing to insure that it is not timed late and use a lean gas mixture as an over-rich mixture will cause boiling very quickly. If you are able to spin the fan easily by hand you may be sure that it is too loose and needs tightening. In driving the car carry the spark lever in a fully advanced position, as a retarded spark will cause overheating.

WHEEL GAUGE.

(H. K. G., Newton, Mass.)

What is the standard gauge for automobile wheels in this country? What part of a motor vehicle is referred to by "chassis"?

The standard automobile wheel tread, or gauge, in this country is 56 inches. However, there is the southern tread, or gauge, 60 inches, which is now being discouraged in favor of the 56-inch tread. One explanation given for the southern gauge is that in early days horse-drawn vehicles, which were built with a 60-inch tread, wore ruts in the roadways of the rural sections and made travel by a 56-inch tread automobile extremely difficult, if not dangerous.

"Chassis," adopted from the French language, means, in its accurate definition, the frame of the car. In the motoring realm in this country, however, it is now meant to indicate all parts of the machine excepting the body, and includes engine, gear, springs, wheels, etc.

REAR END THROWS GREASE.

(H. W. E., Abbott Run, R. I.)

How do you account for my new sedan's throwing oil from from the left end of the rear axle?

It has been run but three months and the factory filling of lubricant is still in the rear axle housing.

It quite possible that a mistake was made in the amount of grease or oil supplied. If grease is used, the differential housing should be packed only about one-third full and if a liquid lubricant, like steam cylinder oil, is employed, its level should not be higher than 1½ inches below the filling hole, only high enough to let the bevel ring gear dip properly. The felt washer at the end of the shaft inside the wheel drum may be too small. Remove the wheel, clean out the grease with gasoline and replace the washer with a thicker felt.

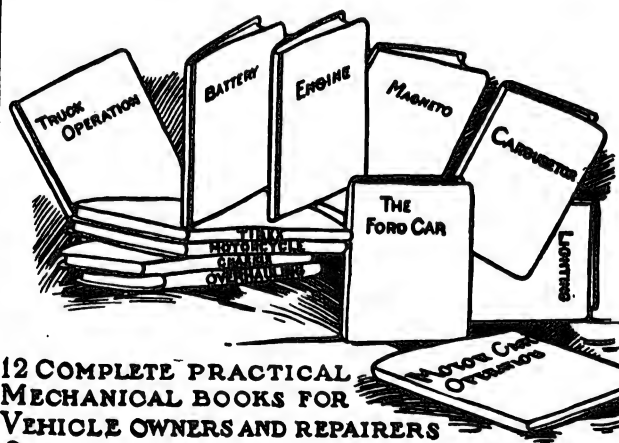
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The Victor Pagé Aero-Type Four

EVERY element of the car works toward avoiding expense.

Air-cooled, light weight, economical, 6,000 to 8,000 miles per set of tires, 117 inch wheel base, disc wheels, 30 h. p. aviation type motor, convertible utility body. Write for details and prices.

Victor Pagé Motors Corporation
Dept. 4, 309 Lafayette St., New York City



| | | | |
|------------|-----|-------------|-----|
| Engine | 35c | Chassis | 25c |
| Magneto | 35c | Lighting | 50c |
| Carburetor | 35c | Operation | 50c |
| Battery | 35c | Overhauling | 50c |
| Tires | 25c | Motorcycle | 35c |

Motor Car Operation \$1.00

**Home and Shop Care and
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Eliminate Your Valve Grinding Troubles



With valve open insert Dual Valve lifter.



Raise valve, insert spring down. Spring rests on holder.



Let valve rest on holder.



Pull out pin, Grind with No. 8 valve releasing valve. Dual Grinder. easily ground.



Valves Ground Without Removing or Replacing Springs.

DUAL VALVE LIFTER and GRINDER enables you to grind valves easily without removing springs.

Complete Outfit with Grinding Compound, Bobber Spring, and 4 Spring Holders

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Valve Lifting End



Four Spring Holders to the Set

Short cut to results—less effort—quick work.

Price is lower than any collection of tools bought separately.

Secure a set today!

THE DUAL TOOL COMPANY

12432 Euclid Avenue,
Cleveland, Ohio

WANTS TO INSTALL BOSCH DUAL SYSTEM.

(A. B. D., St. Louis, Mo.)

Kindly tell me, through the columns of the Journal, if I can install a Bosch high-tension dual system on my 1916 Maxwell in place of the Eisemann magneto which the company furnishes? I would like to use a Bosch coil and battery in connection with the magneto for easy starting. Some of my friends inform me that this is possible and others that it cannot be done. Which is right?

Providing that you can obtain correct fitting with which to connect Bosch high-tension magneto to the magneto driving shaft, you can easily install the magneto that you suggest. As it is difficult to obtain this fitting, we would advise that you purchase instead an Atwater Kent distributor and coil in one unit and connect this to the magneto shaft, using the bevel gears supplied by the company for this purpose. In this manner your ignition current will be obtained from the storage battery through the light wire at the switch, which takes current at six volts from the storage battery. The battery used with the Simms-Huff starting system is 12 volts, and connections are correctly made at the battery to obtain the necessary six-volt current for lighting and for the horn. Tapping this circuit will give you the required voltage for the ignition circuit through the coil and distributor.

LIGHTS DIRECT FROM GENERATOR.

(H. F. B., Attleboro, Mass.)

I have installed a magneto on my car and as I do not use the starter, am using the battery for lights only. Can I remove the battery and use the generator for lights direct or will I need a resistance of some kind?

We do not believe that it is practical for you to do this for any length of time, as the storage battery is placed in the circuit and the charging rate so regulated by means of the third brush as to allow a certain number of amperes to enter the battery between certain speeds of the car as between 15 and 25 miles an hour. Over or under these speeds the generator is

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virtually shut off. The battery floats on the line and absorbs sufficient current to keep it fully charged, replacing the current used by the starting motor and lights and, in many instances, the current used for ignition. Installing a magneto would stop the consumption of current from this source for ignition and, as you state that you do not use your starting motor, this also cuts out a heavy drain of current. As you only wish current for lights, the better plan would be, instead of removing the battery and trying to have the generator supply current for them, to retain the battery and have an expert repairer cut down the charging rate by shifting the position of the third brush in the generator. As a usual rule when one depends on a generator for light, he only gets it when the engine is operating, and the methods recommended for short-circuiting the generator are only temporary and should not be used for any length of time, as damage is liable to result to the generator.

DIFFERENCE IN TIRE DIAMETERS.

(A. R. B., Hartford, Conn.)

I have two three by 3½-inch tires, made by different companies, which differ slightly in cross section and outside diameter. Will their use on the rear wheels produce any serious effect upon the differential gears?

Most assuredly yes. The use of two tires each slightly different in size on the rear wheels will certainly cause the small differential gears to wear excessively on one side. Tires for the rear wheels should be of the same diameter and cross section in every case or undue wear is bound to take place. Where the difference is slight, it may take considerable time for this wear to make itself manifest, but eventually it will show and the small gears will require replacement. Theoretically the small gears of the differential are only supposed to come into action when the car departs from a straight-ahead course, as in going around corners, turning out for passing traffic, etc., and if the same action of the gears occurs when the car travels straight ahead there is bound to be excessive wear.

BRAKE DOES NOT GRIP.

(J. P. M., Putnam, Conn.)

I have recently had the foot brake bands relined and adjusted. At times the brake holds well, but at other times it has no effect on the wheels when applied. The adjustment is good, as the pressure is gradually applied to both wheels at the same time. How can I remedy this trouble?

The condition stated in your letter is dangerous and should be promptly remedied. Are you positive that grease or oil has not worked on to the lining? Gasoline or kerosene will remove this. Frequently grease will work out through the axle housing when the differential housing contains too much lubricant. If on inspection, you find that the lining is dry, it is advisable to apply a good belt dressing, such as is frequently used to prevent belts from slipping. Also tighten the rod leading to the foot pedal so that the full pressure is applied to the brake when the pedal is about three-quarters depressed. This allows unusual pressure to be applied to the pedal in an emergency.

MAGNETO DEFECTIVE.

(H. D. W., Toronto, Can.)

What is the matter with my — car which is giving me considerable trouble? Sometimes the engine will not start. At night I can switch on the lights and spin the engine, and they will come on all right, another time they will not burn. At times the engine will die suddenly without apparent cause. Occasionally it will crank readily and again I have to walk home.

The connections seem all right, but I think that the magneto is out of order.

The magneto winding itself seldom gives trouble, but yours may have done so, and if you cannot locate the defect elsewhere, examine the magneto contact spring, which can be reached by removing the screws that hold in place the binding post on the crank case cover, making sure that the contact is perfectly clean and that it makes a firm connection. The wire leading from the magneto post on the coil box may be defective or imperfectly connected and you had better try replacing it. If this does not remove the trouble, most likely the magneto ground may be unreliable or there may be a short-circuit in some other part of the unit. Install a set of dry cells on the battery side of your switch and remove the magneto for a time while you have it tested by an expert. With the testing instruments he has he will be able to quickly locate the defect in the unit and repair it.

TO INSTALL AMMETER ON HUDSON 1915 CAR.

(L. B., West Warren, Mass.)

Kindly answer through the query department of the Journal the following questions:

*1—How can I install an ammeter on a Hudson Model 6-40, 1916 car, equipped with Delco starting and lighting system?

2—Would you advise installing counter weights on a Ford crank shaft? What would be the advantage?

3—How can I test a Ford magneto tell if it is in good working order with the engine on the work bench?

4—Can you explain why I cannot run a second Ford engine from the coil and magneto in the first chassis? The first engine would run perfectly using the magneto in the regular manner, but when the magneto wire from the first engine was connected to the coil box of the second engine the second engine would operate only on the battery side of switch. Throwing the switches to the magneto side on the first and on battery on the second, the second engine stopped. Why should this happen?

1—The two Hudson diagrams show how the ammeter may be connected. From the diagrams we should say that your Hudson is a 1915 car, as the ammeter was supplied as regular equipment on the 1916 Model 6-40. The diagram clearly illustrates how the ammeter is wired in the circuit.

2—Many advantages are claimed by the manufacturers of counter weights for the Ford engine crank shaft and there is no question that a Ford engine so equipped will operate more smoothly under difficult conditions and show less vibration.

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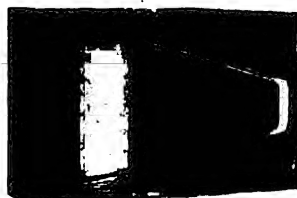
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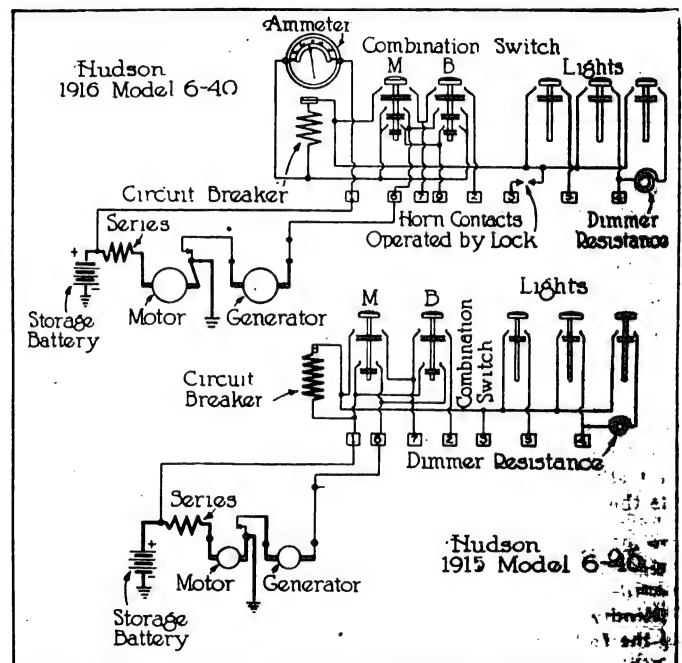
They are easily attached and if properly tightened should never loosen. Such weights are being used in many other pleasure cars using four-cylinder engines, these usually being cast integral with the shaft. For the Ford crank shaft, bolts and clamps are supplied with the weights and should be properly tightened.

An engine equipped with counter weights or balances will show a quicker get-away and also show less vibration. This is noticeable when turning corners or slowing down in traffic.

3—The proper use of a volt-ammeter, sometimes termed a milli-ammeter, will quickly determine the condition of the coils of a Ford magneto while on the work bench. A storage battery is used to supply the testing current while the volt-ammeter will show whether shorts or open circuits are present. Several testing devices are now on the market, which facilitate the testing of all electrical units. These have been explained in the New Accessory columns of the Automobile Journal in past issues.

If the magnets are weak the best course is to purchase and install a new set, as the Ford Motor Co. has a plan which allows the exchange of weak magnets and also magnetos.

4—The only possible explanation of this question is that the coils on the No. 2 car may not be in working order, or that you threw the switch on No. 2 car to correspond with the switch on No. 1 car; that is, they should both be on either battery or magneto at the same time.



The reason the engines of both cars ran on the battery was because the batteries of each car formed a complete circuit in each car. When you switched over No. 1 to the magneto, the magneto was dead and could not run the car, but the battery should have continued to operate the engine of No. 2 car. If you wish to operate either car from the magneto of one, you should also run a second wire connecting the frames of both cars to form a ground through which the return current may flow to the magneto which is supplying current, otherwise but one engine will operate.

The same would also be true if you were attempting to operate a second engine with a battery on one car. Both battery wires should be spliced and the wires run in multiple to the battery of the second car, forming a complete circuit through which the current may flow. The Ford magneto is a low-tension, alternating machine, developing about 18 volts at normal speed of the engine and requires some path for the return current to flow through. In the Ford this is provided in the metal parts of the chassis. The ignition current returns to the coils through the metal parts of the engine and the low-tension current through the metal parts back to the magneto. Connecting the metal parts of the frame completes the circuit between the two chassis and the engines of either should operate on the magneto of one.

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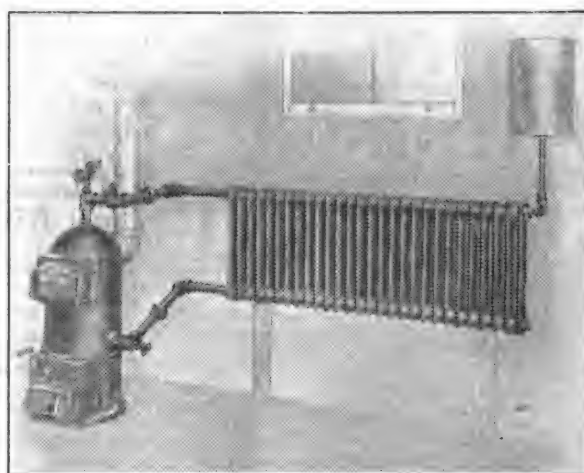
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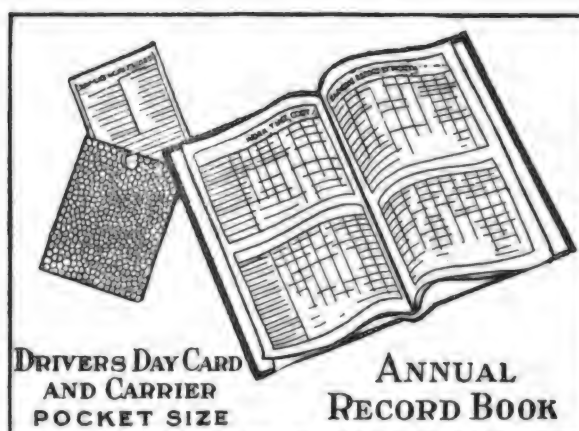
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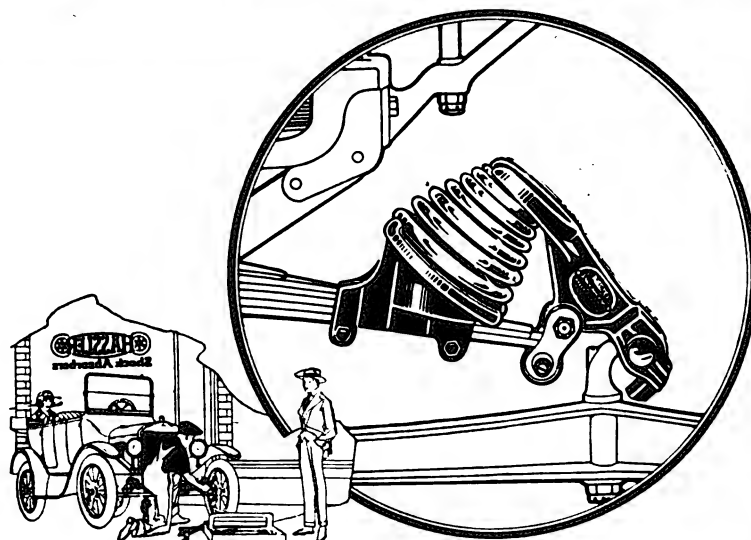
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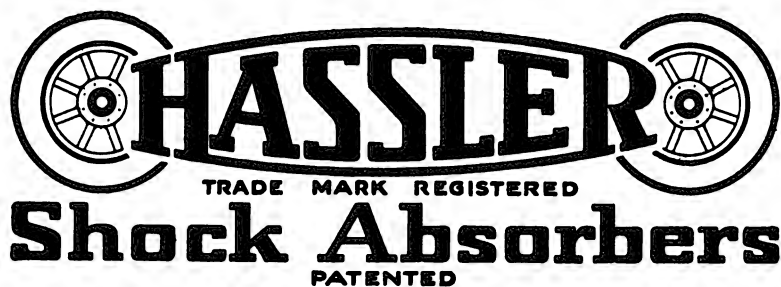
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THE AUTOMOBILE JOURNAL

VOL. LXIX.

PAWTUCKET, R. I. SEPTEMBER, 1921.

NO. 2.

Head Light Laws Essential for Motorists' Safety

Majority of Present State Regulations Based on Recommendations of Illuminating Engineering Society Which Is Assiduously Working for Uniform Legislation

ANY measure that makes for ultimate safety, comfort and convenience in the use of motor vehicles on the public highways, will be hailed with satisfaction and adopted without cavil by the great body of the average fair-minded, law-abiding motorists of the country. This is true even if some initial expense and inconvenience are involved in conforming to such requirements.

One of the great discomforts and dangers of the operation of automobiles after night fall, that has developed with the marvellous increase in the use of motor vehicles, has been the blinding glare from the powerful head lights which has been responsible for so many accidents on the highways. These casualties became of such proportions a number of years ago that several states in which motor traffic was most congested were constrained to adopt measures to mitigate or obviate the nuisance. Most of the laws primarily passed by state legislatures required the use of lights so weak that they were insufficient to illuminate the roads for safe driving. And, at the same time, the law-abiding autoist was sacrificing his safety for the benefit of the other fellow who openly disregarded the law by equipping his car with glaring head lights that jeopardized all drivers he happened to meet.

This open evasion of the old, unsatisfactory head light laws at length caused in its turn the enactment of more drastic measures in the interest of public safety.

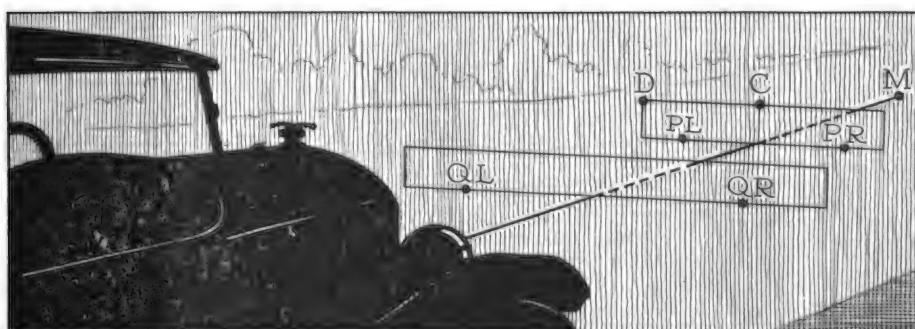
ONE of the pioneer organizations which has been testing out and experimenting on various head lighting devices in conformity to a standard with a view to their adoption in compliance with an efficient and uniform head light law in all the states of the Union, has been the Illuminating Engineering society, the general headquarters of which are in New York City.

The progress made in the uniform regulation of head lighting in accordance with the Illuminating Engineering society system may be noted from the report of its committee on motor vehicle lighting for 1920-1921. This committee is composed of

well-known lighting experts, and is headed by Dr. Clayton H. Sharp as chairman. In the previous report the following states were given as having adopted it: New York, California, Penn-

sylvania, Connecticut, Maryland and Wisconsin. At the time of the last convention news was received that the Province of Ontario had also adopted the system. Since that time it has gone into use in the states of Nebraska, Utah, Iowa and Ohio, while Massachusetts has adopted the system in principle, but has written somewhat different specifications for test which may give very interesting results in practise.

Whereas in the last report it was noted that the states operating under this system registered approximately 25 per cent. of all the cars in the country, the percentage now has risen to approximately 43, according



Massachusetts Head Light Law—C, Glare Point, 100 Feet Ahead of Car, Directly in Front and 60 Inches Above Road (Candlepower Shall Not Exceed 2400); D, Glare Point, 100 Feet Ahead of Car, Seven Feet to Left and 60 Inches Above Road (Candlepower Not to Exceed 800); M, Illumination Point, 125 Feet Ahead of Car Directly in Front and at Road Surface (Candlepower Must Exceed 6400); PL and PR, Illumination Points, 100 Feet Ahead of Car and $5\frac{1}{4}$ Feet to Right and Left of Car at Road Surface (Candlepower Must Exceed 4400 at Any Place Between These Points); QL and QR, Illumination Points, 50 Feet Ahead of Car and $5\frac{1}{4}$ Feet to Right and Left of Car at Road Surface (Candlepower Must Exceed 1000 at Any Place Between These Two Illumination Points.)

to the latest figures. The registration in the Province of Ontario constitutes about 42½ per cent. of the total registration in the Dominion of Canada.

Proposed Uniform Lighting Regulations.

The lighting regulations which the Illuminating Engineering society proposes for universal adoption, as accepted by the executive committee of the International Traffic Officers' association at its last annual meeting, are contained in Article VI, Section 4, of the proposed vehicle law under the caption, "Regulations Concerning the Equipment of Vehicles." The text of this section is as follows:

4. Lamps.

(a) Every motor vehicle and every tractor, except those used exclusively for agricultural purposes, while operated upon the public highways of this state between the hours of one-half hour after sunset and one-half hour before sunrise and at any time when there is not sufficient light to render clearly discernible a person, vehicle or other substantial object on the highway at a distance of 200 feet ahead, shall be provided with a head light or head lights of sufficient power and so adjusted and operated as to enable the driver to proceed with safety to himself and to other users of the highways under all ordinary conditions of road and weather,

or dazzle and so that no dangerous or dazzling light as defined in the specifications provided for in this section, projected to the left of the axis of the motor vehicle is cast in the eyes of a driver of a vehicle approaching in the opposite direction.

(b) **Side Lamps on Trailers.** Every trailer and semi-trailer, except small two-wheel trailers of 1000 pounds capacity or less, towed closely behind a vehicle, and semi-trailers when towed alone, whose over-all length, in either case, including towing vehicle and load, exceeding 30 feet, when on the highways of this state at night shall carry at the front of its left side one or two lamps capable of throwing a white light visible from both sides of such vehicle.

(c) **Rear Lamps.** Every motor vehicle or tractor and every trailer or semi-trailer, during such times as are specified in subdivision (a) of this section, shall carry at the rear a lighted lamp exhibiting a red light plainly visible, under normal atmospheric conditions, for a distance of 500 feet toward the rear, and so constructed and placed that the entire number plate carried on the rear of such vehicle shall be illuminated in such a manner that the number thereon can be plainly distinguished under normal atmospheric conditions at a distance of not less than 100 feet toward the rear. No vehicle shall display any red or green light visible from any point in front of such vehicle unless said light is used as a signal device.

(d) **Spot Lights.** All spot lights used upon motor vehicles and tractors shall be

scientific and laboratory tests under the specifications of the Illuminating Engineering Society, as adopted in May, 1920, to conform with the requirements of this act when used in accordance with the instructions provided for in this section. Such tests shall be made by a duly qualified and disinterested testing laboratory to be selected by the commissioner. The reports of all tests shall be accessible to the public. The commissioner shall immediately upon the completion of the tests of a device made by the authorized testing agency, certify to the clerk of each county and all traffic departments whose duty it is to enforce the law within the state that such device has been tested and substantially complies with the provisions of this act if used under the conditions specified in the report of the testing agency. Such certification shall thereupon be immediately filed by the clerk of each county and all traffic departments and shall be conclusive evidence that such lights, when used under the conditions specified in the report of the testing agency, comply with this law.

In lieu of the tests provided for in this section the commissioner may base his certification on attested copies of reports of tests made for and accepted by another state which by law requires that the head lights of motor vehicles conform to the requirements of this section.

(Note: In states where it is deemed legally advisable to do so, the committee recommends that the specifications of the Illuminating Engineering Society be incorporated bodily into the law.)

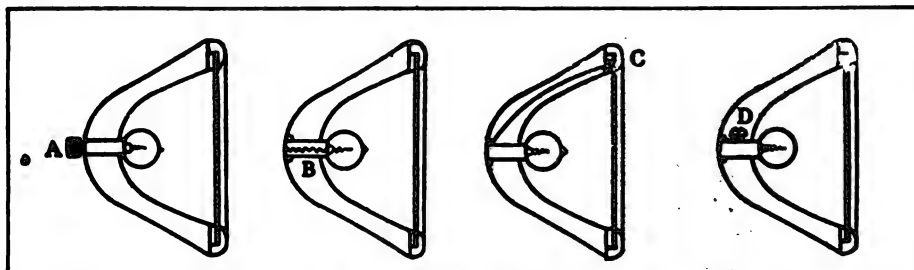
(g) The commissioner shall be authorized to appoint deputies, who in his judgment are properly equipped and otherwise qualified to test and adjust the head lights of vehicles to conform to the law as specified in this section of this act.

(h) All sheriffs and police officers are hereby empowered to issue to any such operator who in their judgment has violated any of the provisions of this section of this act, a summons requiring such person charged with such violation to appear at a specified place and before the vehicle commissioner or an assistant or deputy of his within a period of 48 hours, for a test and any necessary adjustment of the lights of such vehicle. The department is hereby authorized to collect a fee not to exceed one-half dollar for such services. A record of the license numbers of such vehicles and the results of such tests shall be kept by the department and the results of the tests shall also be reported to the person charged with violation of this act. The results of such test shall be prima facie evidence in any prosecution for a violation of the provisions of this section.

If any person so served with summons does not submit to the test required by this section the testimony of the police officer serving such summons shall be prima facie evidence of such violation. Any person charged with the violation of the provisions of this section shall have the right of appeal to the commissioner from the findings of such tests. The failure of any person so summoned to appear and submit to such test shall be a misdemeanor.

(i) From and after the..... day of no type of head light equipment shall be sold or offered for sale within this state unless it first shall have been officially approved by the commissioner.

(j) No head lamp or head light control device shall be sold or offered for sale that is not accompanied by a printed sheet of instructions describing the device in detail, its method of mounting and adjustment, candle power limits of lamps to be used, and any other adjustments that may be necessary to insure its conformity with the requirements of this section and with the conditions specified in the report of the testing agency appointed by the vehicle commissioner to test such head lamp or head light control device. In lieu of printing the candle power values in the instruction sheet they may be stamped on the package.



Adjustment of Patterson Lamps: A, Adjusting Screw or Knob at Rear of Head Lamp Shell—Lamp Bulb Is Moved Backward or Forward by Turning Knob to Left or Right; Lamp Is Held in Place by Ratchet Device. B, and Is Moved by Turning Bulb Slightly to Disengage Ratchet, Then Pulling or Pushing Lamp Socket to Next Ratchet Notch (Care Should Be Taken to Avoid Bulb Breakage); If Necessary, Remove Reflector and Adjust from Rear—Adjustment Is Made by Turning Large Screw, C, in Rim of Head Light Front Just at Edge of Reflector; Lamp Socket Is Held in Place by Set Screw, D, in Sleeve at Back of Reflector—Loosen Set Screw and Lamp Can Be Moved Forward or Backward for Adjustment—After Adjustment Set Screw Must Be Securely Tightened to Hold Lamp in Place.

and such as to be visible from a distance of 500 feet ahead thereof. All motor vehicles, excepting motorcycles, shall display two head lights of approximately equal candle power mounted on opposite sides, which will, on a level road, render clearly discernible a person, vehicle or other substantial object 200 feet directly ahead of the motor vehicle and will at the same time render clearly discernible an object 100 feet ahead and seven feet to the right of the axis of the motor vehicle, except that on motor vehicles which are so governed or mechanically constructed or controlled that they cannot be operated at a speed in excess of 15 miles per hour and on tractors the head lights must render clearly discernible a person, vehicle or other substantial object 100 feet directly ahead of the motor vehicle and must also render clearly discernible a person, vehicle or other substantial object 50 feet ahead and seven feet to the right of the axis of the motor vehicle or tractor.

Motorcycles shall be provided with at least one head light, and not more than two, which will, on a level road, render clearly discernible a person, vehicle or other substantial object 140 feet ahead of the motorcycle and which will, on a level road, render clearly discernible a person, vehicle or other substantial object 70 feet ahead and five feet to the right of the axis of such motorcycle.

The head light or head lights on motor vehicles shall be so arranged, adjusted and operated as to avoid dangerous glare

so constructed or arranged that no portion of the top of the beam of light shall rise or shall be capable of being raised by any person occupying any portion of such vehicle, to a point above the level surface upon which the vehicle stands and 100 feet directly ahead of such vehicle, except that when the beam of light is swung 30 degrees to the left or right of the straight ahead position no limitation is placed on the height to which the beam may be raised. No spot light shall be used on or attached to any vehicle other than a motor vehicle or tractor. Spot lights are lights other than head lights, the direction of which is under the control of any occupant of the vehicle.

(e) **Parking Light.** Whenever any vehicle is standing on a public highway, and not in motion, the operator thereof shall light and keep lighted either the lights herein required or one light visible from both the front and rear thereof, which shall be carried at the left side thereof and shall show a white light when seen from the front and a red light when seen from the rear.

(f) **Tests.** Any person may submit to the Vehicle department for approval types of head lighting equipment, together with an application that such devices be tested as to conformity with the provisions of this act. Such applicant shall pay to the department a fee of \$50. The commissioner shall be authorized to issue certificates of approval of such types of head lighting equipment as have been shown by exact

(k) Registration of motor vehicles or tractors shall be refused by the vehicle commissioner unless it shall appear from proofs submitted by the applicant for registration that such vehicle is equipped with head lights which conform to the requirements of this section.

(l) All other vehicles except bicycles, at the times and under the conditions specified in subdivision (a) of this section, shall carry one or more lighted lamps or lanterns so arranged that said lamps or lanterns shall be visible from every direction for a distance of not less than 200 feet.

(m) Every bicycle while on the public highways shall carry a lighted lamp visible under the conditions of use specified for motor vehicles at least 200 feet in the direction toward which such bicycle is faced, and shall also carry a lighted lamp or reflecting device exhibiting to a motor vehicle approaching from the rear a red light plainly visible under normal atmospheric conditions for a distance of at least 200 feet.

(n) In any case where a vehicle shall be loaded with any material in such a manner that any portion of such load extends toward the rear four feet or more beyond the rear of the bed or body of such vehicle, there shall be displayed at the extreme end of the load under the conditions of use specified above for lights on motor vehicles, in addition to the ordinary rear or tail light hereinbefore required to be displayed on such vehicles, a red light plainly visible under normal atmospheric

both 15-candlepower vacuum lamps and 21-candlepower gas-filled lamps. It is proposed that the test shall be made with gas-filled lamps only, but with one pair of each of the four sizes which have been standardized by the Society of Automotive Engineers. These four sizes are 8 5/32-inch, 8 1/4-inch, nine-inch and 9 1/2-inch. The object of the change is to make the results of the test more representative of the device, inasmuch as different moulds are used for these various sizes. Since the specifications are in use in a number of states, it has seemed desirable first to communicate with the authorities of the states as to their willingness to agree to the change before actually adopting it.

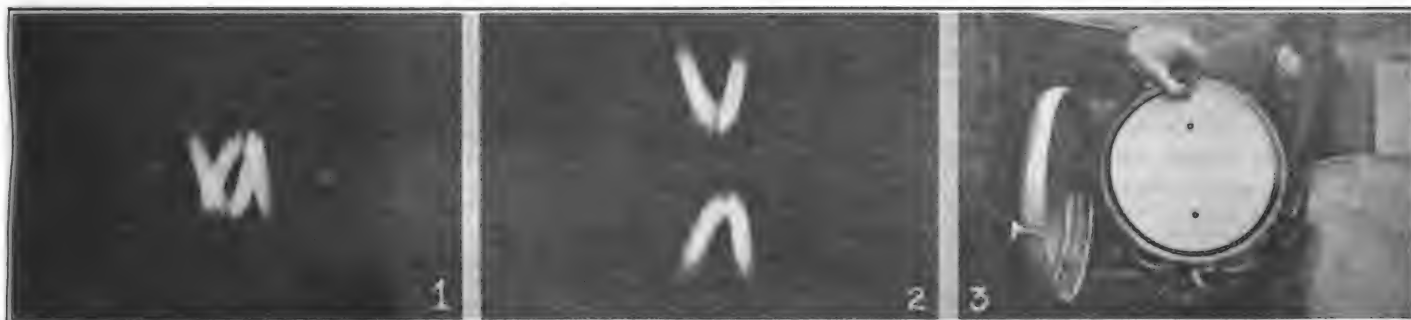
Acetylene Head Lights.

A question has been raised as to the applicability of the Illuminating Engineering society's specifications to acetylene head lights, which are very widely used on motorcycles and trucks. Admittedly the specifications have been drawn to cover the case of the electric head light, and whether they should be applied in their present form to the acetylene head light is at least a debatable question. The point having been raised by the Society

the committee is futile because it has not resulted in more radical improvement. The committee submits that such criticisms are not necessarily just. Its work extends only to a certain point; namely, to the definition in numerical terms of the allowable limits of illumination and glare from head lights on the road, and to the drawing of specifications whereby through laboratory tests the capability of various head-lighting devices to conform to these limits may be determined. The laboratory test does not in any way show whether the actual performance on the road of any given device is within the requirements, or is not. This test simply shows that the device is capable of being adjusted and used in such a way that it will give a performance which is within the requirements and what the proper adjustments are. Whether the device actually does so perform is dependent upon very many features entirely outside the control of the laboratory test.

Focussing and Aiming Lamps of Fundamental Importance.

The matter of focussing and of aiming the lamps is of fundamental importance. Lamps incorrectly focussed or aimed may



Instructions for Focussing Head Lamps: Stand Car on Level Ground, in Dark Place, 25 Feet from Wall; Remove Lamp Glasses, Turn on Head Lights and Cover One Lamp While Focussing Other; Place Card Close in Front of Lamp Being Focused as Shown at 3—Two V-Shaped Images of Filament Will Be Thrown on Wall; to Make Focal Adjustment, No. 1, Move Bulb Backward or Forward Until Images Overlap Each Other as in Fig. 1; Adjustment No. 2, Move Bulb Until Points of V's Are Towards Each Other and Four Inches Apart, as in Fig. 2.

conditions at least 200 feet from the rear; provided further, that at other times while such vehicle is upon the highway a red flag or cloth not less than 16 inches in length nor less than 16 inches in width shall be displayed at the extreme rear end of such load as a warning signal to persons operating vehicles approaching from the rear.

Specifications for Tentative American Standard.

In view of the wide acceptance of the Illuminating Engineering society's specifications, the council of the society, on recommendation of the committee on motor vehicle lighting voted that the committee should, in behalf of the society, submit these specifications to the American Engineering Standards committee for adoption as a tentative American standard. This matter is still pending at the present time.

The work of the committee on motor vehicle lighting during the past year is reported to have been largely in connection with details. It has in mind, however, the recommendation of one modification of procedure when special front glasses and similar devices are submitted for test. At the present time two pairs of a certain size are tested with

of Automotive Engineers and also by the Motor Truck Association of America, and the International Acetylene association, the committee organized a joint meeting representative as far as possible of all those directly interested in the question. It developed from the discussion that there is a practical lack of fundamental data on the performance of acetylene head lamps, so that it was decided that the necessary information and data should be obtained under the direction of a small committee on which the various interests should be represented. Such a committee has been appointed with Dr. Sharp, the chairman of the motor vehicle lighting committee as its chairman, and the collection of data is now under way. It is anticipated that an investigation by means of road tests will be necessary before the matter can be concluded.

Night Driving Conditions Markedly Better.

From reports received by the committee it would appear that conditions on the road in night driving are becoming markedly better. Complaints, however, are still heard of excessively glaring lights, and there has been a tendency at times for some to say that the work of

even with the best of devices produce an intolerable glare or an abominable road illumination, or both. So that, while the laboratory test enables the user to select devices which are capable of conforming to requirements and tells him how they should be adjusted, and so is of the greatest value to him, yet in the last analysis it remains with the user to see that he gets the performance of which the device is capable. The matter is similar to that of horns and brakes; a badly adjusted horn will not make an adequate signal; nor will badly adjusted brakes bring the car to a stop within the limitations of safety. No one expects that the provision of a good horn or of good brakes on a car shall absolve the user of all responsibility for their adjustment and maintenance, neither is it to be expected that by fitting a suitable head lighting device to the car, a proper road illumination will be obtained unless it also is adjusted as it individually should be.

Proper Adjustment a Matter of Education.

This fact is appreciated by all too few of the sellers and users of such devices. Evidently, therefore, the results on the road are to a very great extent dependent upon the education of the motorist with

respect to the proper adjustment of his head lamps and to the officers of the law to whom the enforcement of head lighting regulations is entrusted. With the



Typical Type of Holophane Lens.

education of the user and with the proper enforcement of the highway laws (which is all the time becoming more rigid and more intelligent) it can be expected that the conditions for road illumination laid down by the Illuminating Engineering society as being suitable will be conformed to by a larger and larger percentage of automobilists. It is to the credit of this society that it has formulated a definite standard and has indicated what now seems to be the only practicable road leading to a reform of the abuses connected with motor vehicle head lighting.

Instructions for Proper Adjustment.

An appendix to the annual report of the motor vehicle lighting committee of the Illuminating Engineering society includes instructions for the proper adjustment of automobile head lights in conformity with the rules of that society. While these vary in some minor points from those recommended for compliance to the recently adopted Massachusetts law and possibly by some other states as well, their application will be found of sufficient universality as to be worthy of publication.

Head lighting devices which have been tested and approved under the specifications of the Illuminating Engineering society, for laboratory tests of such devices are thereby shown to be capable of giving, under certain stated conditions, the type of road illumination required in the Illuminating Engineering society's rules. Unless these conditions, which include the rating of the incandescent lamps used, the tilt of the head lamps and focussing, are strictly complied with, the illumination results are liable to be entirely wrong and unsatisfactory both to the user and to others on the road.

Purpose of Head Light Controlling Device.

Controlling devices are for the purpose of securing an adequate road illumination without a dangerous glare in the eyes of other users of the road. This is accomplished by deflecting the major part of the beam toward the road surface, leaving the upper portion of the beam of low enough intensity to avoid dangerous glare, while still allowing enough light in this upper region to enable the driver to proceed with safety. Not only should the light be directed toward the road, but it should be spread sidewise in order that a sufficient portion of the road surface is

rendered visible to avoid danger to a person or object thereon.

Efficient controlling devices improve the road illumination for the user of the device and at the same time create conditions such that other users of the road are not put in jeopardy by glare. However, such devices require a careful adjustment of the incandescent lamp in the focus of the reflector and sometimes a downward tilt of the head lamps in order that the above result may be accomplished, and without careful adjustment in these particulars the use of the pair of controlling devices may result in bad road illumination and excessive glare, their purpose being entirely defeated.

Incandescent Lamps.

Incandescent lamps or bulbs at present on the market are of two types: The vacuum or Type B lamp and the gas-filled or Type C lamp. The filament of the Type B lamp is arranged in the form of a small horizontal coil. The filament of the Type C lamp is in the form of a "V," which "V" is made up of a minute spiral



Macbeth Green Visor.

of wire. On account of the different shapes of the filament in Type B and Type C lamps, in many cases a higher candlepower can be used with one type than with the other, without exceeding the specified limits of glare. See that the marked candlepower of your lamps is not greater than that allowed with the device you propose using, and that the filaments are well centered in the bulbs.

Adjustment of Tilt.

Place the car fully loaded on a level surface, as for instance, the floor of the garage. Measure the height of the center of the head lamps from the floor, and cut off two sticks to a length equal to this height. Stand one of the sticks, near the front end of the car and the other near the rear. Arrange a board so that it will stand on end, and preferably cover it with a sheet of white paper. Set this up as a target at a distance of 25 feet ahead of the lamps so that the light of one head lamp or of both shine upon it. Remove the front glass from the lamp, or use only the plain glass, and operate the focussing adjustment (see below) so that the light forms a small patch on the target. Sight over the top of the two vertical markers on to the target, and place a line at the

point which you thus find. This will give you the horizontal line. If the height of the center of the beam comes at the same height as this mark, the beam is horizontal. If the device which you are going to use is one which requires a tilted beam, put another mark on the target at the requisite distance below the first mark. For instance, if a tilt of two feet in 100 is required, the target being 25 feet ahead of the lamps, the mark should be placed six inches below the horizontal mark. The head lamp is then tilted until the center of the beam comes at this lower mark. By shifting the target the other lamp can be similarly adjusted. The actual tilting of the head lamps is a mechanical adjustment which in some makes of cars is very simple and in others requires some mechanical skill. See that the beams of both lamps point straight ahead. The horizontal distance between the centers of the beams should equal the distance between the centers of the head lamps.

Focus Adjustment.

All or nearly all head lights are provided with an arrangement whereby the position of the bulb may be changed with respect to the focus of the parabolic mirror. This arrangement is sometimes a little difficult to find, but any owner who is in trouble from this cause may well consult a competent garage man. The adjustment of focus, as well as of tilt, can best be accomplished in moderate darkness. It will be found that taking the head lamps without any controlling devices whatever, and throwing the beam from each one separately on to a vertical surface, say a large sheet of white paper held 25 feet or so ahead of the lamps, a more or less round spot or patch of light is seen.

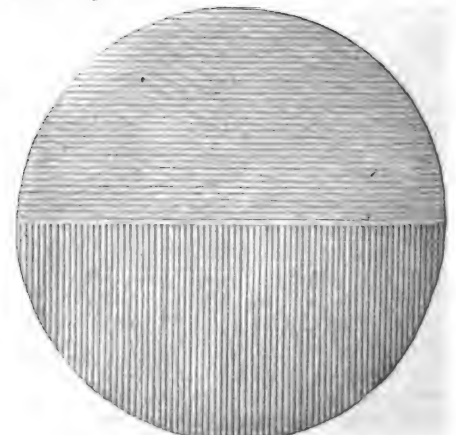
By operating the focussing adjustment the lamp is moved backward or forward with respect to the reflector. The following adjustments are recognized. Some devices require one of these adjustments, others another.

Adjustment No. 1.

The center of the lamp filament is at the focus of the reflector. The patch of light made by the beam is then of minimum diameter.

Adjustment No. 2.

The lamp is drawn backward from No. 1 adjustment. When this is done the patch of light becomes larger and finally a black spot appears at its center. When



Safelite Deflecting Lens.

this spot is just on the point of appearing, adjustment No. 2 has been made.

Adjustment No. 3.

The lamp position is intermediate between No. 1 and No. 2. The size of the patch of light is intermediate between No. 1 and No. 2.

Adjustment No. 4.

The lamp is pushed forward from position No. 1 until a black spot is on the point of forming in the center of the patch of light.

In case the head lamp is so constructed that it is not easy to tell whether you are moving the lamp forward or backward, No. 2 can be distinguished from No. 4 by blowing a cloud of smoke into the beam directly in front of the head lamp. If the rays of light are seen to diverge as they leave the reflector, the adjustment is No. 2; if they converge and cross, it is No. 4.

Be sure that the lamps are positively locked in position after the adjustment has been made. Some makes of head lamps are so constructed that the focal adjustment is altered on replacing the front glass. With these head lamps the correctness of the adjustment can be judged by inspecting the patch of light thrown with the device in place. The top of the patch should be cut off more or less horizontally across the top and the major portion of the patch should be below the horizontal line.

Beam Adjustment.

Having secured the right tilt and focus adjustment, the controlling device which you propose using is affixed to the head lamps, care being taken to see that it is placed exactly in accordance with the manufacturer's instructions, which should accompany the device. The beam is then once more observed on the white paper to see whether the upper half of the beam is properly cut off and the light deflected toward the road. In the case of many devices this cut-off is secured with the bulb at the reflector focus. In the case of some, however (those which obstruct the light from the upper part of the head lamp), the bulb must be brought back toward the reflector in order to secure this cut-off. (Adjustment No. 2.) With still others (those which obstruct the light from the lower half of the reflector) the bulb must be pushed forward ahead of the focus. (Adjustment No. 4.) In any case a little experimenting will show what adjustment is necessary in order to secure the sharpest possible cut-off of the upper half of the beam.



Macbeth Liberty Lens.

Improvised Devices.

There are several ways in which a substantial compliance with the rules may be insured without purchasing special controlling devices. Among these may be noted the following:

Covering the upper half of the front with a dense diffusing coating or with white paper and adjusting the bulb back of the focus, as described above, makes a fairly good expedient.

Covering the upper half of the bulb with a semi-opaque substance and adjusting the focus as above, accomplishes a similar result.

There are other methods which may be employed, but probably none of them will give as good a result as the use of a good commercial device designed for the purpose.

Maintenance of Head Lamps.

Dust and dirt on front glasses and reflectors cut down the efficiency of head lamps very greatly. Therefore periodic cleaning should be resorted to. Old and blackened lamp bulbs give greatly diminished candlepower and should be renewed.

Personal Opinions as to Uniform Laws.

The writer deems it pertinent in this



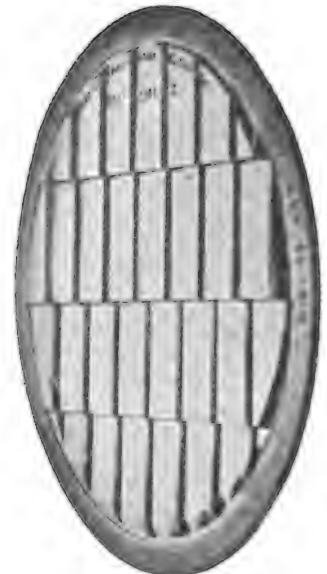
Shaler Roadlighter Lens.

connection to cite some personal opinions in regard to the desirability of the adoption in all the states of a uniform head lighting law, similar to but not necessarily identical with that recently put into effect in Massachusetts. These interviews are given by officials of representative companies manufacturing devices which have been tested and approved by the Massachusetts board of public works.

Federal Law Suggested.

"We have always suggested, when an opportunity occurred, the advisability of having a federal law passed regarding glaring automobile head light lenses. As it is at present we as manufacturers have to submit for tests our automobile head light lenses to every individual state having an automobile head light law with test requirements.

"The tests, as you know, between the states vary very little, and a federal law would simplify matters considerably. I personally have given this matter considerable attention from a scientific optical point of view, and have come to the conclusion that the best lens, in order to create a non-glaring head light, must be so constructed that uniform dispersion and reflection or refraction of a parallel beam of light of sufficient intensity is accomplished so that no direct emanating rays enter into the eye of an approaching driver.



Patterson Lenz.

"Such lenses must be perfectly clear in order to prevent the diffusion of the light in directions where it is not required, at the same time to absorb a minimum amount of light.

"The width of the beam of light on the road is most important, so that a driver can easily recognize the edge of the ditch. Narrow beams of light are dangerous and should be avoided."—Max Poser, Bausch & Lomb Optical Co., Rochester, N. Y.

Massachusetts Regulations Require Even Distribution of Light.

"An automobile manufacturer wrote me a letter the other day in which he stated that he would like very much to equip all the cars they make with the Patterson-Lenz, but that, until all states had a uniform law or there was a federal law passed, he did not feel that he was called upon to go to the expense of equipping their cars. This being the case, the man in a state where they have strict head light regulations is rather unfortunate, as it is necessary for him, after he has purchased the car, to immediately buy an approved lens before he is allowed to drive his car on the highways of that state; while any motorist should have the right to feel that his car should be completely equipped for the purchase price.

"Massachusetts has gone a step farther into the head lighting situation than any other state, up to this time, and I believe the regulations are superior to others for the reason that they demand, in these regulations, an even distribution of light over the roadway, which is much to the advantage of the motorist, by creating zones of evenly distributed light instead of mere points of light. They have also demanded a spread of light over a greater area of the road ahead, which now has been determined by all the automotive industry as the superior driving light.

"As far as the science or art, if it may be so called, in automobile head lighting has gone, I believe that every state could justly and wisely follow the Massachusetts head light law, but we find that many legislators and dealers, and even

(Continued on Page 23.)

THE AUTOMOBILE

(By C. W. PRICE.)

Six hundred and twenty-two people were killed in the Chicago Iroquois Theatre fire, and this catastrophe aroused the whole country and resulted in the transformation of practically every theatre in the United States. In 1920 there were 559 people killed in Chicago by automobiles alone, and if the present rate of increase keeps up, 1921 will show a death toll of over 700.

The Triangle shirt waist factory fire in New York City burned 142 girls to death, and this fire aroused such a protest from the people that drastic legislation covering fire protection of factories resulted in many states. Last year in New York City 746 people were killed by automobiles, and this year, from present prospects, 900 lives will be sacrificed.

In 1920 in the United States there were more than one-half as many people killed by the automobile as were killed in all the factories, mines and on the railroads put together.

During the 14 years since 1906, which practically covers the period of the safety movement in industry, accidental deaths in industry have been reduced 28 per cent., while during that same period deaths from automobiles have jumped from 374 in 1906 to nearly 12,000 in 1920, an increase of 3000 per cent. Probably not more than one-third of the people in the United States are in any way exposed to the hazards of industry, while

practically every man, woman and child, the minute he walks out of his front door, is exposed to this new and giant hazard that goes speeding down our streets.

of deaths and injuries from automobiles in his own or neighboring community, why is it that public sentiment is so slow in accumulating such force that it will demand that the laws be enforced, and something drastic be done to stop this slaughter?

A partial explanation is this: One person in every 12 in the United States owns a motor vehicle of some kind, and many of these owners are so-called "good citizens." Now a large number of these "good citizens" are daily violating the laws, and disregarding the simple rules of safety. They will not tolerate the enforcement of the law, much less will they demand that the laws be enforced. And it should also be said here that a large number of "good citizens" who are pedestrians are equally guilty of daily neglecting to observe the traffic rules, and are thus failing to cooperate in making it possible for the automobile driver to drive safely.

Where will we find a parallel condition where a serious menace threatens the life of the people of every community, and yet a large number of the "good citizens" deliberately disregard the laws which are designed to eliminate the menace?

What is the solution of the automobile hazard which, with the addition of 2,000-

000 automobiles each year, is rapidly assuming such serious proportions? Think this over and supply your own answer.

USE ME CAREFULLY THAT MY NAME MAY BE HONORED.

PRODUCT of brain and brawn, I fill man's primary need for transportation.

I aid the progress of civilization by bringing men closer together.

I am the friend and the servant of mankind.

I am the companion of recreation and the help-meet of work.

I render employment to millions. I speed production and the delivery of the world's goods.

I increase the value of property.

I place the country within reach of the city dweller, and bring the city to the doors of country folk.

USE ME CAREFULLY THAT MY NAME MAY BE HONORED.

TO THE farmer I have been a god-send. I save him time and labor. Through me he has improved his way of living. I have brought the town close to him.

The manufacturer depends on me to carry merchandise from source to factory and on to the markets.

I proclaim the wares of the merchant. I swell his profits. I serve the customer.

I am the feet of the salesman, bearing him to greater service; to more and greater riches.

I bring the physician in time to save the stricken. I keep his mind keen and his hand steady. I restore roses to the cheeks of pallor.

USE ME CAREFULLY THAT MY NAME MAY BE HONORED.

I SERVE the interests of all professions. I am the inspiration of art and of letters.

Man is indebted to me for the broadening influence of travel.

I provide comfort and protection on his way.

Woman realizes her independence through my offices.

To youth, I mean the wholesomeness of the great outdoors, the poetry of motion and the romance of changing scene.

To age, I bring rejuvenation through diversions other than the hearth stone.

USE ME CAREFULLY THAT MY NAME MAY BE HONORED.

I ATTEND man at his birth. Throughout the span of life I am the cradle, the saddle and the rocking chair.

I am the bearer to the final place of rest.

I am the new common carrier—the AUTOMOBILE.

In the face of these stubborn facts, and the further fact that each morning every citizen reads in his daily paper the stories

of deaths and injuries from automobiles in his own or neighboring community, why is it that public sentiment is so slow in accumulating such force that it will demand that the laws be enforced, and something drastic be done to stop this slaughter?

A partial explanation is this: One person in every 12 in the United States owns a motor vehicle of some kind, and many of these owners are so-called "good citizens." Now a large number of these "good citizens" are daily violating the laws, and disregarding the simple rules of safety. They will not tolerate the enforcement of the law, much less will they demand that the laws be enforced. And it should also be said here that a large number of "good citizens" who are pedestrians are equally guilty of daily neglecting to observe the traffic rules, and are thus failing to cooperate in making it possible for the automobile driver to drive safely.

The Tale of the Warmed Over Car

(By ALBERT MARPLE.)

GRADUALLY the warmed-over automobile has forced its way into the consideration of the automobile-buying public with the result that the rebuilt car is now quite an institution—it has become a very important part in the automobile industry of today. Time was when the automobile, when it had served its purpose so far as its original owner was concerned or when the paint became marred in a number of places, was thrown on the junk pile, there to stay. It was naturally melted down and cast into other automobile parts, etc., but these days, while it is true they are thrown on the junk pile they are placed there only temporarily. Later these parts are fitted and matched, finally resulting in a new machine, which, after being given a coat of paint, is sent on the road to do its worst.

This business of "staging comebacks" in the automobile line comes as a direct result of the establishing of what is known as the automobile bone yard. By way of explanation it might be said that an automobile bone yard is a place where cars that are "all in" are taken and where the poor machine that has been laid low by a street car is made to feel at home. Wrecks of all sorts are given the "glad

What Will Become of That Shiny New Car of Yours? Did You Ever Stop to Think? This Picture Graphically Depicts the Usual End of All Automobiles and There Is Every Reason to Believe That Your Smoothly-Running Roadster Will Some Day Join This Motley Aggregation.



hand"—it is the home for the aged and the crippled. The automobile bone yard has not been with us such a great while, but the way it is multiplying and growing would seem to show that it has come to stay.

What wonderful tales these bone yards could tell, could they but talk! What stories of joy rides they would reveal; what tales of pleasure rides in the mountains; what impromptu outings to the beach and then, again, what unexpected dashes for the family doctor! Yes, these bone yards would reveal the sorrows as well as the joys, could they but talk.

The work of wrecking old machines, of sorting over the different parts of these automobiles and using them in the construction of some "sport" car or a warmed-over delivery outfit for the

Chinese laundryman, is now a distinctive branch of the automobile industry. In one of our western cities there is one of these bone yards which covers almost a city lot—and then it is too small. Although this industry is young it contains some experts—fellows who can see at a glance the parts they are looking for and can fit them together in such a way as to have them form really and truly automobiles, machines that are classy and nifty. It is just as easy for this fellow to "figure out" a 1950 French racing creation as it is to construct a "light truck" for the local express man. Just tell him what you want this morning and tomorrow evening the car will be delivered at your door. All you have to do is to tell him your age, the date on which you were christened and size of your hat—he will do the rest.

ONE WAY TO SOLVE THE HIGH COST OF LIVING

A handful of native dates the size of peas, an orange, two crackers and an apple.

Ponder upon this as your entire and sole diet for five days, because it holds

out to you a solution of the H. C. of L.

It can be done; is being done. In fact, by a man encountered the past week by W. F. Seel in one of Southern California's most unique beauty spots, known by

name to many motorists, but visited by comparatively few.

Following out his quest for photographs of worth-while scenic beauties of California, Mr. Seel, a member of the Lexington Los Angeles Co., made the 116-mile trip to Palm canyon in a Lexington.

Better than 35 miles an hour was averaged for the round trip of 232 miles. Though the Lexington car used was right out of a car load shipped to the distributor from the factory at Connersville, it purred over the entire stretch without the necessity of the slightest adjustment.

In the hermit of Palm canyon, whose name is William Pester, the Lexington distributor found a most interesting and entertaining person. The hermit's philosophy is "live and let live" and he practices it to the nth degree.

He eats no meat, partakes of no liquid that will, or has fermented, works as he pleases, plays when he wills and otherwise orders his affairs to suit himself without the slightest regard for the convention of the day. All of which sounds to us like a material delineation of the far-famed "Life of Riley."



From a Casual Inspection One Inclines to Believe That This Mountain Dweller Is a Fine Specimen of Manhood Withal a Lonesome Sort of Chap.

Lexington Wins Again

Piloted by Ot Loesche, Plucky Little Car Repeats 1920
Performance Against Strong Competition,
Lowering Former Mark

LEXINGTON wins again at Pike's peak!

Against the severest competition ever offered in this world's greatest hill-climbing event, a Lexington Special, driven by Ot Loesche, won first money on Labor Day in the second class, cars of 184 to 300-inch piston displacement.

Loesche made the climb of 12 miles and 2200 feet in 19 minutes and 47 4/5 seconds, lowered his own mark made when he won the 1920 hill-climbing championship at Pike's Peak by more than two minutes.

The result of the race is a tribute to the sportsmanship of Frank B. Ansted, president of Lexington and allied companies. Unlike many motor companies which retire from the field to rest on their laurels after winning one great race, Mr. Ansted, with the 1920 title his, insisted upon again entering.

In 1920 Lexington was a new comer in the great Pike's peak event. Its double-barrelled victory startled the motor world. As a result Lexington faced, in the 1921 race, cars of special design from engine to wheels.

The victory of Lexington in its class in the Labor Day race proved highly gratifying to President Ansted. It meant that the Lexington special, with a stock Ansted engine, not only won in its class, but was only a few seconds behind the winner of the much bigger class, that with 300-cubic inch piston displacement and

over, and a car equipped with a special motor.

The Pike's Peak race has come to be not only one of the premier motor events of the world, but it is remarkable because of the fact that it's put to the utmost test every phase of motor car construction, performance, efficiency and reliability.

The most dare-devil motor pilot is thrilled and chilled on his first trip up. Like other mountain roads, the Pike's Peak course is cut into the sides of the slopes. To go over the unprotected edges would mean crashing into depths anywhere from 1000 to a half-mile deep. The hazards of the course are greatly increased by 142 hair-pin turns. Some of these turns are taken at 40 and 50 miles an hour.

The timber line is reached at 11,880 feet above sea level. From that point on the character of the country changes to bleakness and cold. It is here that the famous switchback or turning, twisting, writhing course really begins. There are places where the road is 20 feet wide and the turns are from 20 to 50 feet wide. The average grade is seven per cent, and the maximum 10 1/2 per cent., but always up, up, up.

No car goes very far at any time on high gear. It is practically all second or low gear work for the average car. No car can descend with the use of brakes alone. The braking power of the engine also must be used.

The course starts at Chrystal Creek bridge and ends at the very top of the peak. In more than 12 miles of the course the climb is over 4600 feet and every inch of it is of a serpentine nature.

There were three classes entered for the race, the first being for cars of less than 184-cubic inch piston displacement; second, for cars of 184 to 300-cubic inch piston displacement, and the third or large car class for cars of 300 cubic inch piston displacement and over.

The splendid victory of Loesche and the Lexington special in the class in which it was entered is only another tribute to the merits of the Ansted, the so-called miracle motor, which swept the platter clean in the 1920 race.

NEW PLANT PUNCTURES AUTOMOBILE TIRES.

Nature's adaptability in fitting plants to new methods of spreading their seeds is apparently illustrated in a noxious weed which has recently become troublesome in California and spread to Arizona, and which is known as the puncture vine. Its activities in Arizona, where it is commonly called devil's bur, were revealed to the United States Department of Agriculture during a nation-wide weed survey now in progress.

This vine produces spiny seeds which attach themselves to automobile and bicycle tires which carry them long distances. It is not only an opportunist, but an ingrate, because it is causing widespread trouble to motorists and cyclists by puncturing their tires. The possibilities for damage from this plant are illustrated by the experience of a California man who was reported to have had 70 punctures in one tire, all due to the puncture vine. The weed is considered so serious in California that the California State Department of Agriculture has published a number of special articles on the subject. The plant is being spread with rapidity in sections of Arizona where it never was previously known.

The puncture vine is known scientifically as *Tribulus terrestris*. It is a native of southern Europe, and was probably introduced into America by means of burs contained in the fleece of sheep. The fruit, or bur, splits at maturity into five sections, each equipped with a pair of spines about 1/4 inch long. The sections lie on the ground in such a manner that one of the spines always points upward ready to enter the first tire that comes along. In one California county it is estimated that half of all the punctures in bicycle tires, and a large proportion of punctures in automobile tires, are caused by this weed. The burs also cause severe damage to wool on the backs of sheep.



Smiling Ot Loesche, Who Finished First in This Year's Pike's Peak Hill Climb, Duplicating His 1920 Performance, Is Here Shown at the Wheel of the Winning Lexington Special—This Photo Shows Loesche and His Mount at the Highest Point on Pike's Peak, 2 1/2 Miles Above Sea Level.

The Auburn
Beauty Six
Attracts
Well-Deserved
and Favorable
Attention
as One of
America's
Truly Fine
Automobiles.



Present
Models
Intensify
Refined
Smartness
of Earlier
Designs
and Empha-
size Air
of Luxury.

Auburn Beauty Six

New Offering by Well-Known Manufacturer Combines
Utility and Appearance in Striking Manner—
Shows Many Refinements

WITHOUT changing the underlying principles of design, the Auburn Automobile Co. is introducing a new modern Auburn Beauty-Six, which embodies many important refinements. The new model, known as 6-51, is produced in four different body styles: Five-passenger touring at \$1695; seven-passenger touring at \$1760; sedan at \$2495; roadster at \$1670; coupe at \$2475. The hood is slightly larger than in past models. One-piece panel crown fenders of a new type are employed. The rear doors have been widened. A unique feature which adds to the appearance of the car is an aluminum moulding along the sides in place of the customary bevel.

THESE external refinements, together with a metal cover over the gas tank and a distinctive type of door handles, give the car an even smarter appearance than before.

Special door construction, with double-acting door locks, makes the doors unusually snug fitting and easy to open and close.

The Auburn engineers, it is claimed, in designing this new model worked with one thought in mind, restful riding.

Restful riding, in its broad interpretation, is said to include every quality most desired in a motor car: Confidence in the car's performance; pride in its appearance; ease of handling; complete comfort and relaxation for all its occupants.

The brake and clutch pedals in this new model Auburn Beauty-Six operate with surprisingly slight pressure. The gear shift requires but little more than the touch of a finger. The brake action is smooth and positive.

The turning radius of the car is unusually short for a car of 121-inch wheelbase. This is brought about through tapering the frame at the front.

The front springs have been lengthened and the chassis is mounted on alloy steel spring leaves of unusually high deflection. The rear springs are offset, the shorter and stiffer end being at the front and the longer end at the rear; this gives the effect of an exceptionally long spring and accounts in a large measure for the car's easy-riding qualities.

Double-deck springs are used in the seat cushions, and the front cushion is divided, making it unnecessary to remove the entire cushion in order to get at the battery or tools. All upholstery is genuine leather.

The cabinet in back of the front seat is slightly larger than in past models, measuring 34½ inches wide by 15 inches high. The door to this cabinet is made of walnut.

The instrument board is also of walnut and the instruments are unusually accessible to the driver. All instruments, including the switch, are covered with glass; this gives an exceptionally clean appearance.

The radiator core and tanks are constructed entirely of copper and brass. The shell is removable and is made in such a way that it can be enamelled, thus assuring a lasting finish.

The radiator is constructed in a unique way, in that air space is allowed between the core and shell. This space carries off the heat and protects the finish of the shell.

The radiator core is cushioned against shocks and twists by the use of a spring mounting of distinctive type provided for the purpose.

It is claimed that, with reasonable care, this car will perform without the development of squeaks or rattles. No metal touches metal in the assembly of chassis and body.

Thick non-squeak pads are placed between the frame and the body; also be-

tween the fenders and other sheet metal parts with which they come in contact.

Chassis lubrication is made extremely simple by the use of numerous oilless bushings and soft oil cups conveniently placed. There are only two grease cups on the entire chassis. Furthermore, spring lubrication is practically automatic, which tends to make the springs most quiet in operation.

SPECIFICATIONS.

Motor—Continental 7R Red Seal.
Cylinders—Six, Cast En Bloc.
Bore and Stroke—3¼ by 4½ Inches.
Ignition—Remy.
Starting and Lighting—Remy.
Clutch—Borg & Beck.
Wheelbase—121 Inches.
Tires—32 by Four Cords.
Price—\$1695 Five-Passenger Touring.

PREPARE FOR WINTER SHOWS.

Application blanks and diagrams of floor space for the 22nd National Automobile shows in New York and Chicago were sent out Tuesday, Sept. 6. As usual the national shows will be held under the auspices of the National Automobile Chamber of Commerce, Inc., and will be under the personal supervision of S. A. Miles. The New York show will take place in Grand Central Palace, Jan. 7-14, 1922, and the Chicago Exposition, Jan. 28-Feb. 4, in the Coliseum and Armory.

All applications for space, to be considered in the first space allotment, must be sent in not later than noon Oct. 1.

Motor Camping Is Very Popular in the South and There Is Hardly a City That Has Not Made Special Arrangement to Handle This Class of Transients—Many of the Public Camping Grounds Are Equipped with Laundries, Hot and Cold Water, Gas Ranges and Other Modern Conveniences That Make Camping Not a Whole Lot Unlike Home Life.



Tenting on the New Camp Ground

Invasion of Motor Camper Salvation of Forests Says
Noted Writer Who Tells of Wonderland Awaiting
Tourist with "the Brown Tent on the Running Board"

(By ALBERT PAYSON TERHUNE.)

THE most conspicuous thing in the West now is the sign, "Free Municipal Camp Ground." Almost every city, town and hamlet, from the Dakotas to the Pacific, maintains such a camp ground, and it is in constant use. Moreover, the national parks are full of campers who have come by motor and who do not go to the hotels at all. Before the first of August there had been 100,000 visitors at Yellowstone, the majority of whom, a hotel man woefully complained, were "sage ticks." He meant that they were sage-brush farmers or ranchmen who had come into the park with their families, on an outing, and who were camping. The Pacific highway in Oregon, which extends south from Portland all the way to the California line, is full of touring automobiles, and on every second car (even more frequently, perhaps) you see camping equipment bulging from the rear seats and strapped to both running boards.

THE motor accessory stores in all western cities display various ingenious devices which fasten to the car and which can be let down and converted into beds and tents. Certainly thousands of people have been brought into the country in their motor cars, many of whom, perhaps, would be forced to remain at home if they had to depend on railroads and hotels.

The West, of course, is a roomy and a democratic land. If you aren't quite democratic enough to put up at a municipal camp ground—and it is a test, I admit—there is always a chance to find some wild and secluded spot; or, for that matter, you can drive in at any ranch and find a welcome under a tree. Since I got home to Massachusetts, however, I have been wondering what would happen if any considerable number of our eastern people who possess small cars and small incomes were to decide that the inability to pay railroad fares and hotel charges wasn't going to keep them from having a real vacation, bought tents and coffee pots, and started out to camp it from New York to Bretton Woods. I live on the motor road between those two points. Would I invite families in to camp on my place? In a word, no. Would my neighbors to the south, to the north? Again, no. All along our road

we struggle to keep our places gardened; we cherish every smallest tree; we dread fire; we hate the litter of cans and rubbish nine out of every 10 campers al-

ways leave in a region where camping is not an instinct; finally, I fear it must be confessed, we are far from hospitably democratic at heart and would resent any



The Demand for Comfortable Camp Outfits Has Become so Great That Many Manufacturers Have Made a Specialty of Supplying Equipment Designed Especially for This Class of Trade—It Is Said That This Tent with Its Collapsible Cots Can Be Erected in a Quarter of an Hour and Can Be Taken Down in Similar Time—It Folds in Such a Way as to Take Little Space on the Running Board and Weighs No More Than an Extra Passenger.

invasion of our privacy. Some wild spots to camp in might be found if one knew the country and where to turn off the highway; but it would require an accurate knowledge to avoid trespass and to be sure of the purity of the water supply. At present, in short, the low-priced motor holiday possible to thousands and thousands in the West is in the East practically an impossibility.

But any one who has seen western families on the road will admit this is rather a pity. Here especially, where our population is most congested in cities, we most need the opportunity for escape and for free contact with the open spaces. It seems to me that the motor has opened up a whole new field for rational and comparatively inexpensive outdoor enjoyment, and that to develop and cultivate this field in the East is the new task confronting our park and state forest departments. The idea of a park as an open space full of bedded pantries, cannas, and settees close to a city was well enough before the advent of the motor. It is antiquated now, or, rather, it is inadequate.

There are millions of acres of deforested and waste land in the northeastern states, a large percentage of it unfit for agriculture, which should, of course, be reforested; which sooner or later has got to be reforested if we are to survive comfortably, or even survive at all. At present, however, only the feeblest beginning of such reforestation has been made, largely because insufficient public pressure has been brought to bear on our short-sighted state legislators. But if state forests could be administered something as our national parks are administered—that is, as outdoor playgrounds—if their vast potential recreational value could be developed and stressed, a demand for their constant increase and improvement would arise, and not only we but future generations would be gainers.

There is no quicker and more effective way to develop the recreational side of



The Trailer Is the Drawing Room Car of the Open Road—It Admits of the Campers Having Nearly Every Luxury of a Permanent Camp. Weighs Little, Tows Easily and Costs Very Little in Proportion to the Pleasure It Gives—With an Outfit Like the One Pictured the Camper Can Stay Away from Home Indefinitely and This Form of Conveyance Is Growing in Popular Favor Among Experienced Motorists.

state forests in the East than to open them and advertise them as motor camp grounds. There is, for example, a considerable tract of forest land in western Connecticut now controlled by the state. In western Massachusetts 60 miles north there are two tracts of state forest (at present practically inaccessible to the ordinary tourist), one of 7000, the other of 14,000 acres. One or two similar tracts under state control in southern Vermont and southern New Hampshire would fill in a chain to the White mountains, where at last some provision is made for the camper. In the case of existing forests and reservations it would be a comparatively simple matter to post the roads in

to them, put these roads into condition where necessary, designate some attractive place near protected water as a camp ground, and erect there sanitary facilities and dig a rubbish disposal pit. A few signs of the proper sort, combined with the pressure of the responsible campers, will soon teach those who use such camping sites to use them properly.

But even a bit of litter or actual damage at first is a small price to pay for the best possible advertisement of the state forest idea—getting people into the forests, showing them how the forests can be used for their pleasure and their profit, giving them an object lesson in the spiritual and the material advantages.

Hearne Sets New World's Record for 150 Miles



The Race Driver Must Have a Thorough Knowledge of His Car, Be Familiar with the Track on Which He Is Driving and Have Nerves of Chilled Steel, but His Equipment Is Also an Important Factor—Good Wheels, of Which There Are Several Different Makes, Are Usually a First Consideration of the Driver Who Combines Caution with Courage—Otherwise the Game, Fascinating and Remunerative Though It May Be, Is Hardly "Worth the Candle."

Driving a Disteel-equipped Duesenberg at North Bay Speedway, Cotati, Cal., Aug. 14, Eddie Hearne set a new world's record for 150 miles. He made the run in 1:21:19 1/5, which is almost five minutes faster than the previous record. His average was 110.6 miles per hour. Hearne finished a complete lap ahead of his nearest competitor. The entire run was made without a stop. As a result of this performance and the showing made by Disteel-equipped cars in recent races at Uniontown and Indianapolis, the professionals are ready to admit that steel wheels are proving a valuable aid in the racing game.

"There is no question but that Disteels deserve a large share of credit for the showing at Cotati," says Hearne. "I had absolutely no tire trouble whatever and made the run without a single stop. Because of their wonderful stamina, resilience and ease on tires and bearings, I believe that Disteels are the fastest wheels made. Certainly they suit me clear down to the ground and I am somewhat particular I believe."

Prolongs Life of Car

Quiet Gear Shifting Also Eliminates Unnecessary Noise and Is Indispensable in Efficient Use of Engine on Hills

CHAUFFEURS, motorists and other operators who drive passenger cars or trucks should make it a practise to shift gears as quietly as possible. This is an art which is easily acquired and adds much to the comfort and pleasure of the driver and occupants of the car.

In early types of cars the necessary attention was not given to this detail, but in later models the manufacturers have so designed the clutch and transmission gear shift, that with slight practise this loud clashing of gears and grinding noise has been nearly eliminated. It is the motorist who has recently purchased his first car who is usually found to be the offender in this matter. The manufacturer is interested in eliminating any factor

is an expert in handling that particular make of car, and as he drives the car from the curb the gear shifts are made without effort and without sound, and before you are aware of the fact the car is in high speed. Jerking of the passengers is avoided and all noise of gear shifting is eliminated. This is part of the technique of the experienced salesman and demonstrator and he would not amount to much as an employee if he were not expert in driving. When a man gets into a strange car he can hardly be expected to shift gears noiselessly under all conditions. It takes a little time to become adjusted to the working and feel of the car. But the man who owns and drives his own car should take pains at the first opportunity to learn quickly all about the peculiarities of that particular car and be able to make the required gear shifts with ease and confidence.

Shifting gears at the proper time and in the proper manner saves racking the entire mechanism of the car. In the average car it is not usually difficult to shift from a lower to a higher gear, although some drivers manage to make a big racket in doing it. One of the sources of trouble in respect to this is a dragging clutch. To eliminate this many manufacturers now equip their cars with a clutch brake which comes into action when the clutch pedal is depressed all the way, stopping the clutch from spinning and allowing the gears to mesh without grinding.

How to Obtain Best Results.

On the average car the best result can be obtained in shifting from first to second gear by speeding the car a little on first, shifting out of first, hesitating an instant in neutral and then shifting into second. From second to third speed the lever does not pass through neutral so all that is necessary is to slide the lever from second to high with the clutch pedal depressed. Unless the clutch brake action is harsh the clutch pedal should be depressed all the way in making the shift. On cars that combine the service brake pedal and clutch in one pedal a dry-disc type of multiple-plate clutch is used so that in separating the plates the clutch comes to a stop without dragging, making gear shifting an easy and simple matter. A clutch brake is not necessary with this type as the gears are shifted noiselessly.

Care should be exercised, however, not to speed the car too high before shifting, and the throttle should be in the closed position and the accelerator pedal released during the time of the shift.

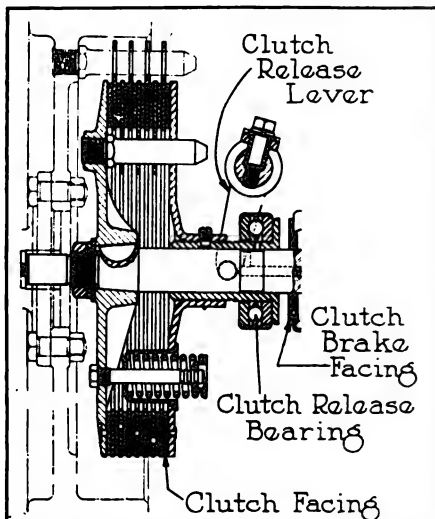
Changing from a higher to a lower gear is where much of the humiliation is experienced. This is usually due to the fact that the car is being driven at per-

haps 25 or 30 miles an hour, and the driver thinks, for some reason or other, that he is going to have use, say, for the second speed. Immediately he begins to shift, the inhabitants for miles around know what has happened by the resulting noise. Usually no difficulty will be experienced if the car speed is sufficiently diminished. As a general rule when shifting to a lower gear the speed of the car should be a little less than when shifting to a higher, between the same relative gears.

Change Not Often Necessary.

In ordinary driving it is usually unnecessary to shift the gear to first speed except when the car is brought to a complete standstill. On a fairly level road the second speed gear need not be employed until a speed as low as five or 10 miles an hour has been reached. The gear should only be shifted when the car speed has been decreased to this extent, and the driver should guard against shifting before slowing down, simply because his judgment tells him he is going to have to use a lower gear, if he desires to make a silent shift.

To belong to the Silent Shift club is to have become established in the automotive world as an efficient driver. The membership in this club is not overcrowded and it would be a good thing if all drivers would seek to qualify for admission into its sacred precincts.

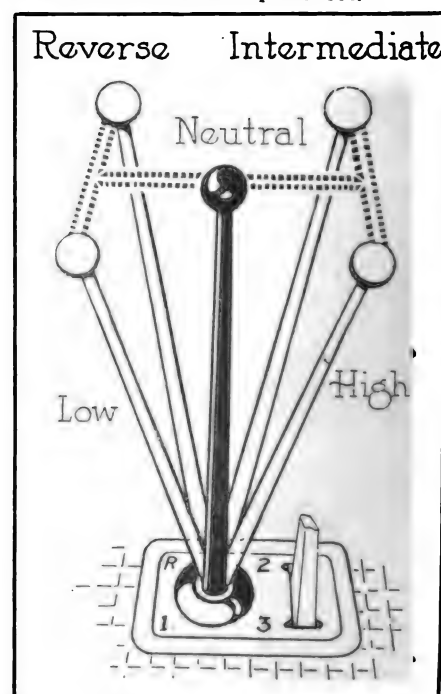


Illustrating Positions of Gear Shift Lever with Relation to Speed Changes—This Varies with Different Makes of Cars as No Standard Is Followed—However, as 75 Per Cent. of the Manufacturers Use This Method, It May Be Considered as Standard.

in motoring which is destined to take the joy out of life at the steering wheel. Six, eight and 12-cylinder engines have fewer problems along this line, but the manufacturers of four-cylinder engines have been able to design their engines for higher speed with greater gear reduction, which makes it easier for the engine to pick up the load from the very lowest speed, and consequently lessens the trouble with gears. The three-speed sliding gear transmission seems to be the most satisfactory, considered from all standpoints, including cost of manufacture, ease of repair and care required.

The Quiet Motorist Demands Respect.

The motorist should learn at once how to manipulate the gear shift lever with as little noise as possible. This can be accomplished in a very short time by assiduous practise in shifting gears. In taking a demonstration of a new car, you will nearly always note that the demonstrator



Multiple Dry-Disc Type Clutch Showing Location of Clutch Brake, Which Enables Driver to Shift Gears in Gear Box Without Clashing and Grinding—Many Cars Do Not Have This Clutch Brake and Gear Shifting Then Becomes a Science.

Clearing the Farm with the Family Auto

THERE is no end to the uses to which the motorist will put the family car.

In years past the "old bus" has been used in many ways and for hundreds of different purposes, but it remained for J. H. Kimball, living in the San Fernando valley, near San Fernando, Cal., to "spring a new one." This never-before-heard-of feature was in the form of using the family car to clear a piece of ground several acres in extent, which was covered with a dense growth of cactus, mesquite, yucca and brush. After a fellow has wrestled with these pests for a week or so he realizes that it is something to clear a stretch of land which is covered with them.

Very shortly, however, after purchasing this property, Mr. Kimball put his "gray matter" to work to devise some way of eliminating the greatest part of the labor of clearing this land. The result was the creation of a novel type of stump puller. This consists of a six by six-inch beam, 14 feet long, braced upright upon a small two-wheeled truck. A steel claw is



"To Fit a Race Horse to a Plow," Is Analogous to Using the Automobile in the Manner Depicted—The Car Will Give Good Service If Used as the Manufacturer Intended, but a Good Husky Tractor Would Do This Sort of Work in Better Fashion, It Seems to Us.

fastened to the lower end of the pole, while to the upper end of the timber a steel cable is attached. When it is desired to remove one of these "tough nuts" from the ground the stump puller is rolled to the foot of the victim, into which the steel teeth of the claw are forced. The stump is then chained to the puller so that it may not slip off during the pulling process, and upon signal the chug-chug car is persuaded to proceed ahead slowly. As the car moves forward the result is that the upper end of the upright, the cable attached to which having also been

fastened to the rear axle of the car, is pulled downward. This naturally results in the prongs of the claw being raised and the stump being lifted gracefully out of the ground. When the stump is once clear of the earth the auto continues to move forward, pulling it to the burning pile, where it is dumped.

Used in this manner the car takes the place of a dozen laborers and surely "earns its keep." The work of this device is rapid and efficient and there is no reason why "the other fellow" should not profit by this little "innovation."

A BOON TO THE MOTORIST



The Automatic Door Opener Is Something Which Will Instantly Appeal to Every Motorist Who Houses His Car in a Private Garage—It Appears to Be Constructed on Scientific Principles and Will Undoubtedly Become Popular.

A. Traube of Brooklyn, N. Y., has just invented a new automatic door opener designed especially for garages, which ought to interest thousands of motorists who own their own garages. It is said to be the first invention of the kind. An

iron plate is set flush with the surface of the driveway in the natural position where a wheel of the car would rest in coming into the garage. The weight of the wheel depresses the plate, which is connected with the locking device by a

cable running up inside the garage. This releases the lock and springs on the door open them, so that the motorist is able to drive directly in without getting out of the car and fumbling for his keys. The picture shows a car which has just depressed the plates and the garage door opening.

THE CARE OF UPHOLSTERY.

Has it ever occurred to you that the material in the upholstery of your car is of as good or better quality than the tapestry or leather with which your furniture is covered? Knowing this do you take the same care of this covering as you do of that on your furniture? This upholstery is subjected to much more severe use, because so much road dust is collected and ground into it.

By using the household vacuum cleaner, with the long hose and one of the many nozzles with which it is equipped, all the dust and dirt may be drawn out of the plait and folds of seat coverings.

On the velour coverings of closed cars it is best to use one of the small brush attachments. On the open cars one of the small flat metal nozzles will find its way into the plaits in fine shape.

Periodic cleaning will assist in keeping the colors of the cloth in your car bright and looking new. None of us would consider leaving a costly piece of tapestry-covered furniture exposed to the road dust and fading action of the sun, but we will leave a much more expensively upholstered automobile exposed to both.

Long Awaited
Durant Car
Lives up to
Enthusiastic
Forecast
Made for It—
Will Prove
Popular
with the
Fastidious
Motorist.



Enclosed Model
Shown Here
Has Had
Large Advance
Sale and
Factory
is Busy
Day and
Night
Supplying
Demand.

Has Many Special Features

New Durant Has Unique Frame Construction—So Designed as to Be Easily Accessible—Genuine Leather Used in Upholstery—Choice of Color Finish

THE three models of the Durant Four, as announced recently, consist of a touring car, coupe and sedan. The touring car sells for \$890 and the coupe and sedan for \$1365, f. o. b. Lansing, Mich. In the Durant Six the line will consist of four models, priced as follows: Touring, \$1650; roadster, \$1600; coupe, \$2250; sedan, \$2400, f. o. b. Muncie, Ind. As the similarity of names indicates, the four and six will be handled as one line by the same dealers. The closed models of the four-cylinder line are a three-passenger coupe and a five-passenger sedan, each of which sells for \$1365 f. o. b. The coupe, seating three, has an individual seat for the driver, and the sedan is a full five-passenger type. A feature which instantly appeals to intending purchasers is the accessibility of the chassis units.

WHILE designed along conventional lines, one of the chief features of the new Durant Four is its clean chassis layout. The engine, with cylinders $3\frac{1}{2}$ by $4\frac{1}{4}$ inches, has a piston displacement of a trifle over 200 cubic inches and is of the overhead valve type.

The cylinders and top half of the crank case are cast integral, but the cylinder head is cast separately, so that the valves may seat directly on water-cooled surfaces. The valves are operated through tappet levers in the usual manner. The arms of the levers are of unequal length so as to give a slightly greater lift to the valves than the stroke of the tappet rods.

The water jackets extend all the way down the cylinder barrels and there is no offset in the casting at the lower end of the piston stroke. The tappet rods extending down the right-hand side of the cylinder block are enclosed by a sheet metal cover, and there is a second cover of pressed steel over the valve mechanism. The cylinder head is held to the cylinder block by eight cap screws, of which the four on one side hold in place the caps over the tappet lever pivot shaft.

The pistons are of iron fitted with three rings above the wrist pin, which is clamped tightly in the connecting rod and its ends bear directly on the cast iron of the piston bosses. The piston and connecting rod can be removed as a unit through the bottom of the engine after the oil pan has been removed. The crank shaft is fitted with three unusually large

main journals to take the wear.

The electrical equipment is Auto-Lite, the starter being located on the left-hand side, and drives to a gear ring cut on the fly wheel through an inboard Bendix drive. The transmission gear box is located amidship and the fly wheel, starter and drive are uncovered so that both the starter and its driving mechanism are in plain view on the chassis and very accessible. The generator is mounted on the opposite side of the engine, forward, and is driven from the cam shaft through enclosed gearing. The high-tension cables from the distributor to the spark plugs are carried through a metal tube around the forward end of the cylinder block. All other wiring is encased in flexible metallic tubing.

Lubrication is by the circulating splash system, a gear type pump being carried on the outside of the crank case on the right-hand side and driven from the generator through a flexible coupling. Oil is fed to the main journals and to the connecting rod bearings direct, and a pressure gauge, mounted on the dash, shows the pressure whenever the engine is operating. The splash of the rods in troughs underneath supplies all other reciprocating parts of the engine with sufficient lubrication. An oil reservoir in the base of the oil pan supplies necessary oil for the pump through a wire strainer.

The engine is cooled by pump circulation, the pump is mounted on the forward right-hand side and is driven by a "V"

belt from the forward end of the crank shaft. The same belt is used to drive the large four-bladed radiator fan. A peculiarity of the water pump is that its impeller is located partly within the engine water jacket and its housing is of substantial semi-cylindrical form. This type of construction brings the pump drive shaft very close to the cylinder block and assures free circulation of the water by thermo-syphon action in case of failure of the pump or its drive.

The frame is made of $4\frac{1}{2}$ -inch channel sections with few cross members, of which two are quite flat, providing a very flexible frame unit. The muffler is a long tube about six inches in diameter, with relatively heavy walls and securely fastened to the cross members by flanges at both ends, adds further stiffening to the frame.

MECHANICAL FEATURES OF DURANT FOUR.

Engine—Valve-in-Head Type, Fully Encased.

Bore and Stroke— $3\frac{1}{2}$ by $4\frac{1}{4}$ Inches.

Clutch—Disc, Plate Type.

Transmission—Selective Sliding. Three Forward, One Reverse.

Rear Axle—Three-Quarter Floating. Gear Adjustment at Wheel.

Springs—Semi-Elliptic, Front and Rear.

Chassis—Lubricated by Alemite System.

Wheelbase—110 Inches, Actual Measurement.

Tires—31 by Four-Inch Cord.

Body—Full Five-Passenger, Stream Line, Upholstered in Genuine Leather.

Price—\$890 f. o. b. Lansing, Mich.

How England Is Solving Problem of Rural Roads

Is Understood to Have Adopted Principles Set Forth in Following Dissertation—750,000 Motor Vehicles Pay Tax Totalling \$45,000,000

(By EDWARD JOHN STEAD, Somerset, England.)

IN ENGLAND a very great deal has been written about widths of roads for the accommodation of modern traffic, and while admitting that a large proportion of what has been suggested is doubtless very desirable, it is submitted that under prevailing conditions, and notwithstanding the desirability of widening roads as a provision for future traffic developments, the widening of rural roads to 40 feet or 60 feet is today an impracticability. It is hoped that the consideration of this paper will result in the evolution of a practicable proposition suitable for immediate adoption. To this end the author expresses the opinion that a standard width of 18 feet is sufficient for rural roads, with the exception that in certain cases of considerable mixed fast and slow traffic 27 feet should be adopted in order that there may be room for three vehicles abreast, thus permitting the fast to overtake the slow.

THE necessities of the times call for the exercise of great discrimination in the selection of roads to be given the greater width, and it is believed that the proportion of 27 foot roads would prove to be effective if roads now 14 feet to 17 feet wide could be widened to 18 feet throughout.

Bearing in mind that a practicable line of action is being sought, the selection of materials which will withstand the traffic presents very considerable difficulty, and it is obvious that water-bound macadam must still be used on many miles of roads for some years to come. It is not proposed to deal with concrete as a road material since the author is of the opinion that the high initial cost, the uncertainty of a sufficiently long life to justify such initial cost, and the fatal bar of construction in half-widths puts it out of bounds for serious consideration as part of the present problem.

The improvement of road surfaces will undoubtedly be provided by the increased use of asphaltic, bituminous and tarred macadam, using wherever practicable local materials in order to cheapen the construction. Before such surfaces can be laid many roads will need strengthening and reshaping, probably additional drainage, and also the provision of some form of side support, or curbing all such necessities of course, adding to the cost.

The price of tar has reached such a figure that a greatly extended use of bitumen may be looked for, though large quantities of tar will still be required for surface treatment. Bitumen is now quoted at a lower price than tar. On such roads as traffic requirements justify its use two-coat asphalt work is probably the most suitable method, the plan being adopted of executing such a length annually on each selected road as financial considerations permit. On many roads this method would provide the requisite additional strength as well as supply a suitable surface.

There are differences of opinion as to

the most satisfactory method of constructing bituminous macadam roads. It is submitted that the use of a previously coated material is preferable to the grouting method, as the latter is slower in execution, being to a certain extent dependent upon weather conditions, is less certain in its results, and permits more voids. Tarred macadam has the advantage that it can be laid some days after tarring, but bituminous mixtures must be laid while still hot. The lack of suitable plants for bituminous work, and the present expense of providing the same, will be a detriment to many authorities in the use of bituminous work. If it were practicable for the wealthy companies supplying bitumen to provide on loan suitable plants, with a competent man in charge for portions of a year, passing the plant on to various authorities, it is thought that a real want would be met and a difficulty disposed of. Even if such a course were desirable the contractors experienced in the work will not be able to carry out all the work of this character which will be required, and

necessarily large quantities of it will have to be done directly by the road authorities. The continued use and extension of tarred material will depend to a large extent upon the price of tar, and the extent to which facilities for the increased use of bituminous macadam are provided.

The publication of the Ministry of Transport's designs for standard road signs should cause a very great improvement in the sign posting of the country roads, though there will doubtless be numerous authorities who will consider that expenditure on this work is not an urgent necessity, and it is to be expected that in many instances action will be deferred until other forms of road work have assumed a less pressing aspect.

The financial aspect of the problem under consideration must receive serious attention, and the question of how the moderate policy outlined above is to be financed at once obtrudes itself. In many quarters it is apparent that the high water mark in taxing has been reached, and a strenuous campaign of economy



Rut-on Woods Highway Follows the Course of the Wharfe River for Many Miles and Is Said to Be One of the Few Absolutely Level Roads to Be Found in British Isles.

Recent View Taken on

Benchurch Road, Isle of Wight—That Blind Curve in the Distance Might Bother an Unskilled Driver, but They Get Used to Them in England, Where Every Rural Road



Is a Succession of Hairpin Turns—Incidentally History Records That This Type of Road Had Few Terrors for Jimmy Murphy and His Ducesenberg. He Won the Grand Prix at France Over Highways Similar to This—The English Writers Claimed That the Four-Wheel Braking System Was Responsible for the Win, but We Incline to Favor the Driver.

is at present in full swing. If it is correct to say that the cost of road works is now two and a half times what it was in 1914 and the assumption is allowed that the amount raised by rate is double what it was in 1914, it is clear that less work would be done now than in 1914 if it were not for government assistance in respect of classified roads.

In 1913-14 an authority spent £92,000 on rural main roads. In 1920-21 the similar expenditure was £167,000. The estimates for 1921-22 are £247,000, of which £150,000 is estimated to be provided by the authority, and £97,000 by classification grants. Taking two and a half times the 1913-1914 expenditure, the result is £230,000. It is therefore evident that the sum of £17,000 is the available provision for improvements, better surfacing and to cope with the ever increasing traffic. It is submitted that such provision will not suffice. Apparently the only hope of further financial provision is to be found in an increased yield in the tax from motor vehicles, the number of which is "increasing by leaps and bounds." It would be interesting to know how the additional £9,000,000 will be distributed when the number of vehicles reaches 1,500,000. Will the existing percentages contributed towards classified roads be increased to absorb it or will additional roads be classified?

The figures given above relate to main roads under a county council, and by the help of grants towards classified roads it is shown that they can barely carry on. The case of the district roads under rural district councils is much worse. It is probable that the mileage of district roads which will benefit by classification grants will be small, but the increased costs due to char-a-banc and milk-lorry traffic will be large. These increased costs if met at all must be met by rating, but if the limit in that direction has been reached then the district roads must perforce remain in poor condition for some time at least.

It is thought that the above brief state-

ment of the rural road case will clearly indicate the necessity for forming a correct estimate of the possibilities of great improvements in that class of road in the near future.

The following conclusions are suggested for adoption as a line of action in the immediate future:

1. That the general width of rural roads should be 18 feet, with a few exceptions, which should be 27 feet.
2. That concrete is not a suitable material for rural roads, because of high initial cost, uncertainty of sufficiently long life and the great disadvantages of construction in half widths. (This conclusion does not apply to new roads.)
3. That it is desirable to extend the use of bituminous and tarred macadam for road surfaces to the utmost extent of financial possibilities, selecting the more important roads for early treatment.
4. That the surface-tarring of water-bound macadam should be continued, pending conversion to bituminous macadam, and that district roads subject to

mechanically-propelled traffic should be surface tarred wherever possible.

5. That the Ministry of Transport's standard road signs should be adopted forthwith, and every reasonable endeavor made to proceed with the scheme.

France has, I am told, now abolished all speed limits except in towns and villages. I cannot remember ever having noticed that one ever existed at any time. For France and French roads, north and south, east and west, are not a bit like England and English roads; hardly anywhere is there the least similarity to be found between them, beyond that both naturally lead from one place to another.

French roads have few or no hedges, almost all their corners and crossings are open, most of them are as straight as ever they can be, and almost every one is wide. Not one of these conditions can be paralleled here; a visitor from Mars might be pardoned for imagining that the two countries were a million miles apart.

What applies to France, and to the Continent generally, does not in the least apply to us, at all events in the matter of highways. While we have much to learn from them, they, too, can pick up many wrinkles from us.

A TABLOID HISTORY.

The automobile was introduced from 1895 to 1900, giving the good roads movement established in 1880 a marked impetus that pushed it far to the front. The introduction of the motor truck in 1904 sent it forward to even greater heights. The following year New York state took the lead by appropriating \$50,000,000 for good roads. In 1912 the first Federal Aid convention was held by the American Automobile association at Washington and Congress established a joint committee to go into the whole field of government participation in road work. That year Congress also appropriated \$500,000 for the improvement of selected post roads. Individual local and state highway officials established in office in the meantime, began their agitation.



This Road Passes Through Uffington—It Looks Substantial and Solid, but the Loads We Pile on to Our American Commercial Vehicles Would Make Short Work of It.

Few Cars Have Been as Eagerly Awaited as the Buick Four and Dealers Report Heavy Sales of the New Arrival.



This Fine Automobile Is the Result of a Virtual Demand by the Motoring Public—It Is Already Deservedly Popular.

Addition to Buick Line

Popular Four Restored with Many Refinements—
Embodies General Buick Characteristics—Rapidly
Finding Favor with Car-Owning Public

AMONG the new cars recently announced is the new Buick four-cylinder model, which follows closely the lines of the six-cylinder cars now manufactured by that company, but is smaller in size and at the same time embodies the features found in the former time-tried models. The new four-cylinder Buick is manufactured in four models as follows: 34, roadster; 35, five-passenger touring; 36, three-passenger coupe; 37, five-passenger sedan. For some time dealers and owners have virtually insisted that the Buick Co. manufacture a car with all of the characteristics of Buick, equipped with a four-cylinder engine which, in relation to the chassis, would have comparatively the same power, smoothness and flexibility, and as economical and dependable in operation as the six-cylinder valve-in-head engine.

IT IS claimed that the Buick engineers have accomplished all of these things in this new model. Power for the new Buick Four is supplied by the usual type of four-cylinder, I-head vertical engine suspended at three points and having the heads removable. The bore is $3\frac{3}{4}$ inches and the stroke $4\frac{1}{4}$ inches, providing a brake horsepower between 35 and 40. The crank shaft is a three-journal type fitted with long bearings, of bronze, faced with babbitt. The connecting rods are 12 inches long, of extra length to reduce vibration to a minimum. A Marvel carburetor equipped with a new automatic heat control is a feature of the new Buick Four, while the radiator is of the square cellular type, of Buick design, and is a part of the cooling system which consists of a centrifugal type water pump driven from the generator shaft, and the large four-blade fan, driven from the timing gear set.

Lubrication is supplied by a circulating splash system which provides automatic lubrication to all bearings and internal parts of the engine. The Delco system of starting and lighting is used as in all other Buick models during the past few years, having proved unusually satisfactory in the hands of Buick owners.

The clutch is a dry multiple-disc type of conventional Buick construction and is

in a unit with the transmission gear set and the engine. The transmission is of the usual sliding gear type, bolted to the fly wheel housing and consists of three speeds forward and one reverse. The gear ratios of the transmission are as follows: First speed, 13.068; second, 7.88; third, 4.667; reverse, 17.408.

A single universal joint is used in the rear of the transmission and this is enclosed in the upper end of the torque tube which covers the propeller shaft and cares for the torsional strains of the rear axle. This method of construction completely encloses all driving units and protects them from the abrasive action of dust, also preventing grease leakage.

The frame is a deep channel section, strongly reinforced with four cross members. The steering gear is a semi-irreversible type fitted at the top with a steering wheel 17 inches in diameter and the steering jacket is finished in black enamel.

Gasoline is fed to the engine by a vacuum tank, the main tank being located at the rear end of the frame and having a capacity of 10 gallons, a sufficient quantity for a day's run, as the new Buick Four has already established a record for high mileage and economy both on fuel and oil.

The wheelbase of the new Buick is 109

inches and the turning radius is 36 feet. All slow-moving bearings of the chassis are equipped with the Alemite high-pressure lubrication system which forces oil to every part of the bearing and forces out any dust or old grease that may have collected. The tire equipment is cords.

The color scheme which has been adopted for this new line of Buicks is a highly-finished body painted black with a white stripe around the top of the body on the open models, while the enclosed bodies are painted similarly and are fully equipped with adjustable windshield, visor, windshield cleaner, dome light, ventilating windshield, adjustable windows, and sunshades for the rear windows. All models are fitted with non-glare head light lenses and tire carrier with extra rim. The upholstery in the open models consists of genuine leather over coiled springs and the closed models are trimmed with a worsted material.

The two-passenger roadster sells for \$935, the five-passenger touring for \$975, the three-passenger coupe \$1475, five-passenger sedan \$1650. All prices are f. o. b. Flint, Mich. The shipping weights of the various models are as follows:

Model 34 Roadster, 2310 pounds; Model 35 Touring, 2380 pounds; Model 36 Coupe, 2430 pounds; Model 37 Sedan, 2650 pounds.

Overhead Valve Growing in Favor

**Proves Economical in Use—Develops Abundance of Power
—Has Small Piston Displacement—Easy on Fuel and Oil—
Removable Cover Admits of Easy Adjustment**

DURING the past few years the general public, including the motorist, has become educated to the fact that the I-head, four-cycle automotive engine, commonly known as the overhead valve engine, is best adapted to passenger car power plants because of its snappy power, economy in operation and greater power per cubic inch of piston displacement.

Previous to 1908 the I-head engine was little known, and then only as a two-cylinder opposed engine, and about this time one of the prominent passenger car manufacturers introduced this engine to the public as a four-cycle, four-cylinder, ver-

quired it, and this with the dust caused excessive wear.

Accessories in the shape of coiled springs were early placed on the market by independent accessory manufacturers, which were claimed to eliminate this noise by holding the rocker arms under spring tension usually provided at the side of the rocker arms, or it may consist of a spring cap which is fitted over the top of the push rod between the push rod and rocker arm, taking up the lost motion between the rod and arm.

During the last two or three years improvements have been made in this type

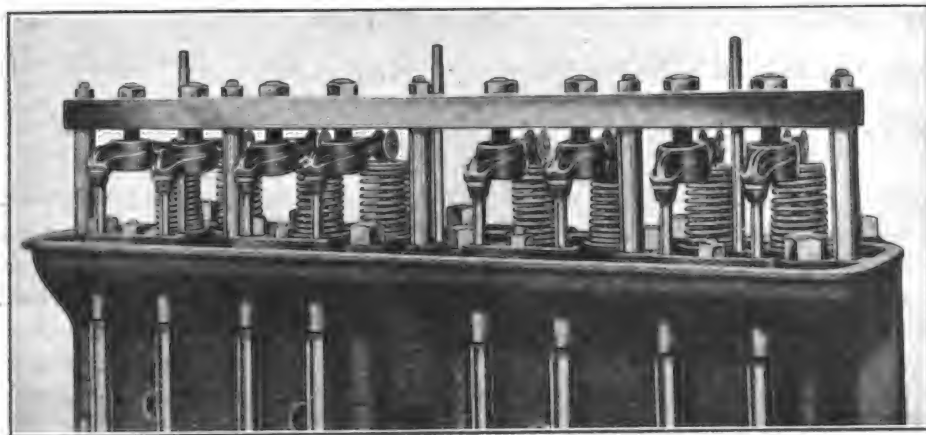
the noise of the valves. Lubrication is supplied either by hand, feeding the oil at long intervals to the drilled rod to which the rocker arms are fitted and from which they obtain their lubricant, or by a mist from the engine base, which is forced by crank case compression through hollow tubes surrounding the push rods, leading to the valve mechanism chamber. The excess mist after lubricating the valve mechanism passes through a breather pipe in the top of the cover and is dissipated into the air.

Either method supplies constant lubrication to the valve chamber, the latter allowing the mechanism to work in a constant fog of oil when the engine is operating.

Overhead Valve Mechanism Improvements.

Improvements have been made in the manner of supporting the rocker arms and it is found in the later designed engines that the ends of the rocker arms rest respectively on the push rod at one end and the valve stem on the other end with the center or fulcrum positioned against an adjustable bolt and nut fastened in a rigid bar supporting all adjustments, which may consist of four or six, according to the number of cylinders used in the block. This type of arm support is styled the "rocking chair" support because of its ease of adjustment when the engine is operating, and from the fact that the arms perform their work with a minimum of wear.

Many motorists prefer to service their cars at home and the overhead valve engine lends itself readily to this class on account of the ease with which the valves can be removed for grinding and the



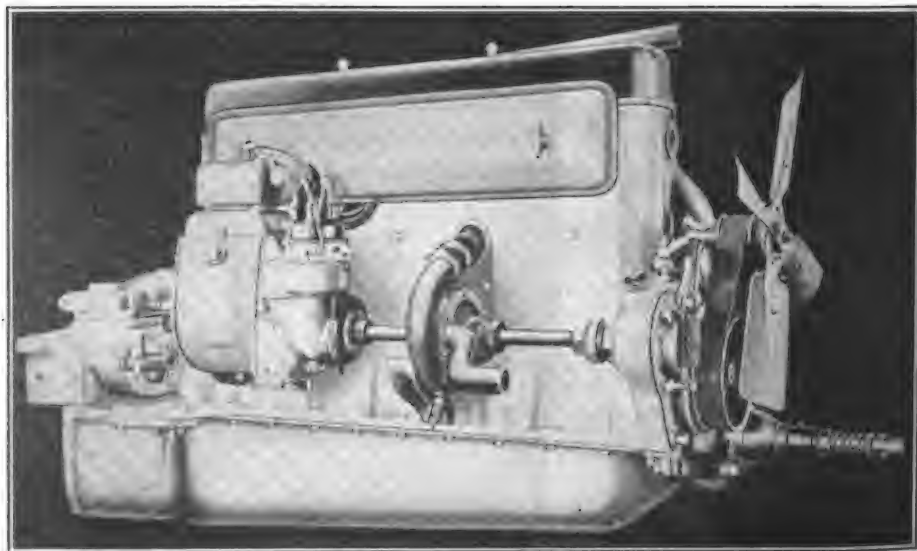
Latest Rocking Chair Type of Overhead Valve Mechanism Which Is Becoming Very Popular—Allows Valve Adjustment While Engine Is in Operation.

tical engine, using it in a light-weight, medium-priced car, which proved very popular with the trade. This company has continued to use this type of engine each succeeding year, improving it in various respects, till at the present time it has reached a state of perfection which practically fills the wants of the most discriminating motorist.

A few years later other passenger car manufacturers, recognizing the advantages to be gained by using this type of engine, began to equip their cars with a modified form of the original I-head, four-cylinder, four-cycle engine. At the present instance fully 20 per cent. of the passenger car manufacturers, according to available figures, are using overhead engines for standard power plants in the cars which they manufacture.

In past years much criticism was directed against this type of engine in that after it had been in use for a short period it would become noisy. The overhead valve mechanism was located in the open where dust and grit, blown in through the radiator by the fan, could easily reach the rocker arm and push rod bearings, the abrasive action of which quickly cut the bearings, allowing them to become noisy. Then, too, owners would fail to lubricate the bearings as often as they re-

quired it, and this with the dust caused excessive wear. The valve mechanism is covered with a metal cover which is easily removed when desired, protecting the mechanism and deadening



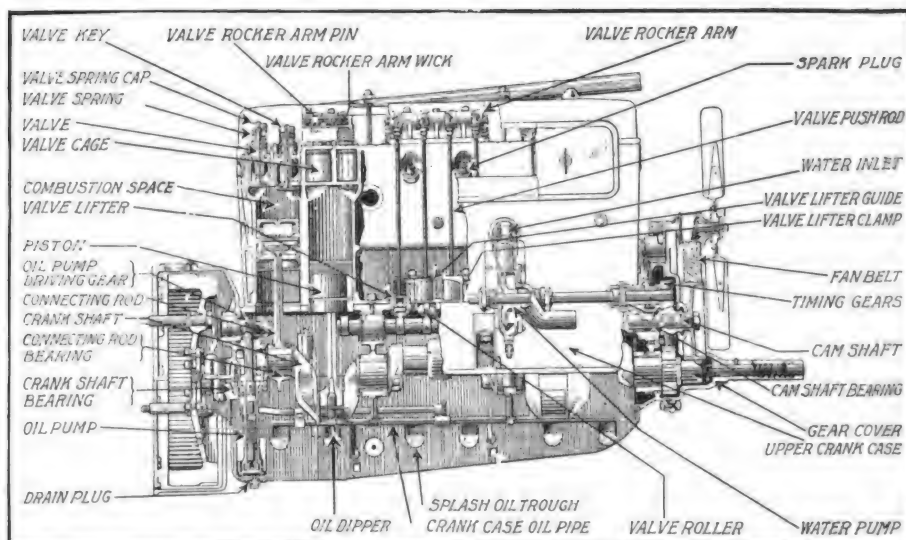
Buick Engine with Overhead Valve Mechanism Completely Enclosed—Removable Covers to Spark Plugs and Valve Mechanism Provide Accessibility.

cleaning of carbon deposits from the engine combustion chambers.

There are two types of overhead engines in use, both of which are proving very popular at the present time. One type is fitted with a removable head, separated from the cylinder block casting by a copper asbestos gasket, having the valves positioned in valve seats milled in the under side of the head and extending through the head in guides. To grind the valves of this type it is necessary to loosen the holding nuts of the removable head, removing the head and valve mechanism as a unit, and grinding the valves at the work bench. The second form does not use a separable head, but the valves are positioned in the cylinder heads in removable cages, held in place by means of a locking ring with copper asbestos gaskets above the valve cage and under the locking ring. The valves are removed one at a time and ground by hand in a vise at the work bench. The vise holds the stem and the cage is turned by hand. This latter type is similar in construction to the original overhead valve four-cylinder vertical engine introduced in 1908 and has been retained by this company in all later passenger car models. Statement is made that this type of engine is somewhat more costly to build, but that the accessibility of the valves and valve mechanism more than offsets the original first cost so that the company feels justified in retaining it.

The removable head type previously mentioned also offers accessibility as a feature and other points which are of interest to the motorist who services his car.

A feature which applies especially to



Typical Six-Cylinder Overhead Valve Engine Showing Various Units Clearly Lettered.

the overhead valve engine is that there are no side pockets to retain the burned gas after the explosion has occurred and the piston on its return stroke has scavenged the combustion chamber. All burned gases are quickly expelled and the incoming charge of new gas is not mixed with burned gas. The flame area of the combustion chamber is small so that all of the mixture is ignited practically at the same instant, giving a clean, powerful explosion, which acts at once on the head of the piston, developing the utmost power from the charge of gas. The piston displacement in cubic inches is in reality smaller than in other types of engines and this feature, combined with an

explosion using all of the burned gas, gives a power plant which is at once powerful and economical.

The oiling system is also a feature of this type of engine which shows economy, many of these engines operating for long mileages before it is necessary to replenish the oil supply.

For hill climbing, power and accessibility the overhead valve engine has established a place among motorists in general which cannot be shaken. That other manufacturers of passenger cars are realizing this situation is shown by the ever-increasing number who choose this type of power plant for their cars, this being especially noticeable this year.

(Continued from Page 9)

some automobile clubs, believe that these head light laws are for the benefit of the lens manufacturers and are a detriment to the motoring public—and the only reason that they can feel so is because they have not gone far enough into the subject; but if they would drive at night through a state such as Massachusetts or Connecticut, they would realize what a real advantage and safeguard are proper non-glaring head light lenses which conform to the laws, as against blinding lights and the constant use of the dimming switch.”—J. H. Cattell, Secretary and Treasurer, Warner-Patterson Co., Chicago, Ill.

Recommends Standard Regulations.

“While I do believe that it would be of great advantage to the general driving public if all the states did adopt a uniform head light law, I would hesitate to recommend the adoption of the Massachusetts regulations, as against the standard regulations recommended by the Illuminating Engineering society. In the first place, the Massachusetts regulations have only been in effect a very short time and it is not possible to tell, at this time, just how well they meet requirements, both from the point of enforceability and of giving each driver a light which is safe for himself and safe for other drivers he meets. It is my opinion that the Massachusetts requirements of light distribution are in some way an ad-

vance over the distribution required under the Illuminating Engineering society's proposed standard head light law.

“No matter how good regulations may be framed, they are worthless if the law is not properly enforced, and one of the biggest drawbacks to enforcement up to the present time is the lack of uniformity in the regulations of different states.

“During the summer months, particularly, in every state in the Union where there are improved roads, nearly 40 per cent of the cars on the road are cars from other states. It has become an act of general official courtesy to permit non-residents to disregard traffic laws of the states they are in to a greater or less degree, and the effect of this semi-official sanction of law infringement has been to make it almost impossible to enforce these laws against the residents of the state in which such infringements are permitted.

“If the traffic laws and laws in regard to head lights were uniform in all of the states, there would be no excuse for permitting a man to drive in Connecticut, for instance, with head lights which did not comply with the Connecticut regulation, but which might comply with the regulations in Missouri or Illinois as, with uniform laws, if he was not complying with the regulations in Connecticut he would not be complying with the regulations in his home state, and there would be no excuse for his not suffering the

penalty of failure to comply.”—F. H. Ford, Manager Roadlighter Department, C. A. Shaler Co., Waupun, Wis.

In Favor of Sane Laws in All States.

“I have no hesitancy in expressing my opinion in favor of sane head light regulations in all of the states of the Union. I believe they should be so drawn up as to be capable of speedy application and easy observance and so designed as to become a benefit rather than a hindrance to automobile owners.

“Some of the present head light regulation laws are not all that could be desired, which is due perhaps to the fact that the framers of these laws are not familiar with the subject and perhaps are unwilling to accept the advice of those with long experience in the lamp field.—John A. Bowman, Comptroller, the John W. Brown Manufacturing Co., Columbus, O.

Should Be Federal Law to Approve Devices.

“With reference to the advisability of the adoption of a uniform head light law such as that of Massachusetts, I could say that in my opinion there should be a federal law and provision made to approve devices by federal authorities so that all states would have a uniform law and a device approved in one state would automatically be approved in another.—E. H. Hobbie, Saferlite Lens Co., 220 Fifth Avenue, New York City.

Kelsey Tows Seven-Ton Steam Roller

Demonstrating the practical value of a new form of friction transmission, a Kelsey Six, built by the Kelsey Motor Co., of Newark, N. J., recently towed a steam roller weighing more than seven tons a distance of a mile along Broad street in that city. This unusual performance attracted much attention and was followed by a crowd of 7000 people, as well as a number of photographers and cinema news camera men.

The reason for the demonstration was that for years one of the principal objections to the use of friction transmissions has been the claim that this construction permitted slippage. The demonstration showed conclusively that this difficulty has been eliminated in the application of the friction transmission principle embodied in the Kelsey Six.



That the Kelsey Friction Transmission Successfully Eliminates Slippage Was Effectively Demonstrated by This Unique Test.

During the demonstration the car was stopped and started at will, each time taking up the load without slippage or hesitation. In fact, the automobile tended to pull the heavy roller at a speed too great for the steering mechanism of the roller and at one time this nearly caused breakage of the roller's governor.

The Kelsey friction transmission is combined with shaft drive through a jack shaft and internal gears enclosed within the brake drums on the rear wheels.

This construction makes possible the elimination of 123 parts, many of them of considerable weight. Among these are the clutch, gear box and heavy bevel gear and pinion at the rear axle.

Immediately after the demonstration a long train of Kelsey automobiles, built in the local plant, carried the entire organization of the Kelsey Motor Co. out to inspect the large tract of land purchased recently by the company where work will be started immediately.

It is particularly interesting at this time of alleged depression in the automobile industry to see a motor car company going ahead as the Kelsey Co. is doing.

HOW ABOUT IT?

Comfort in driving is a matter of clothing as well as of position of steering wheel and soft upholstery. A growing fashion among motorists is to wear knickerbockers when on long trips—and that is a very sensible and convenient sort of clothing.

TRADE-MARK DECISION FAVORABLE FOR WALDEN-WORCESTER.

In recent proceedings brought by the Walden-Worcester, Inc., of Worcester, Mass., against the American Grinder Manufacturing Co., Milwaukee, Wis., for the cancellation of the latter's trade-mark "Blackhawk," it is reported that the United States patent office has rendered a decision favorable to Walden-Worcester, Inc., the patent office examiner holding that the Walden-Worcester, Inc. (which is proprietor of the trade-mark "Tomahawk") has been injured by the registration of the trade-mark "Blackhawk."

Walden-Worcester, Inc., has also recently instituted a suit in equity in the Federal District court of Wisconsin against this same company for unfair competition, and trade-mark and patent infringements. C. N. and F. W. Jonas Brothers of Chicago, Ill.; San Francisco and Los Angeles, California, are stated

To Minimize Danger at a Bad Curve

One of the most effective ways of minimizing the danger at bad curves on much travelled highways is to erect reflecting



Polished Steel Might Be Better Than the Glass Mirror Which, to Our Way of Thinking, Would Prove Too Tempting an Opportunity for Some Amateur Marksman to Resist.

mirrors. As a motorist approaches the mirror he can see clearly in the glass any machine in close proximity on the other side of the curve.

This unique and effective means of "seeing around the corner" has been erected at a very dangerous curve along the famous Susquehanna trail.

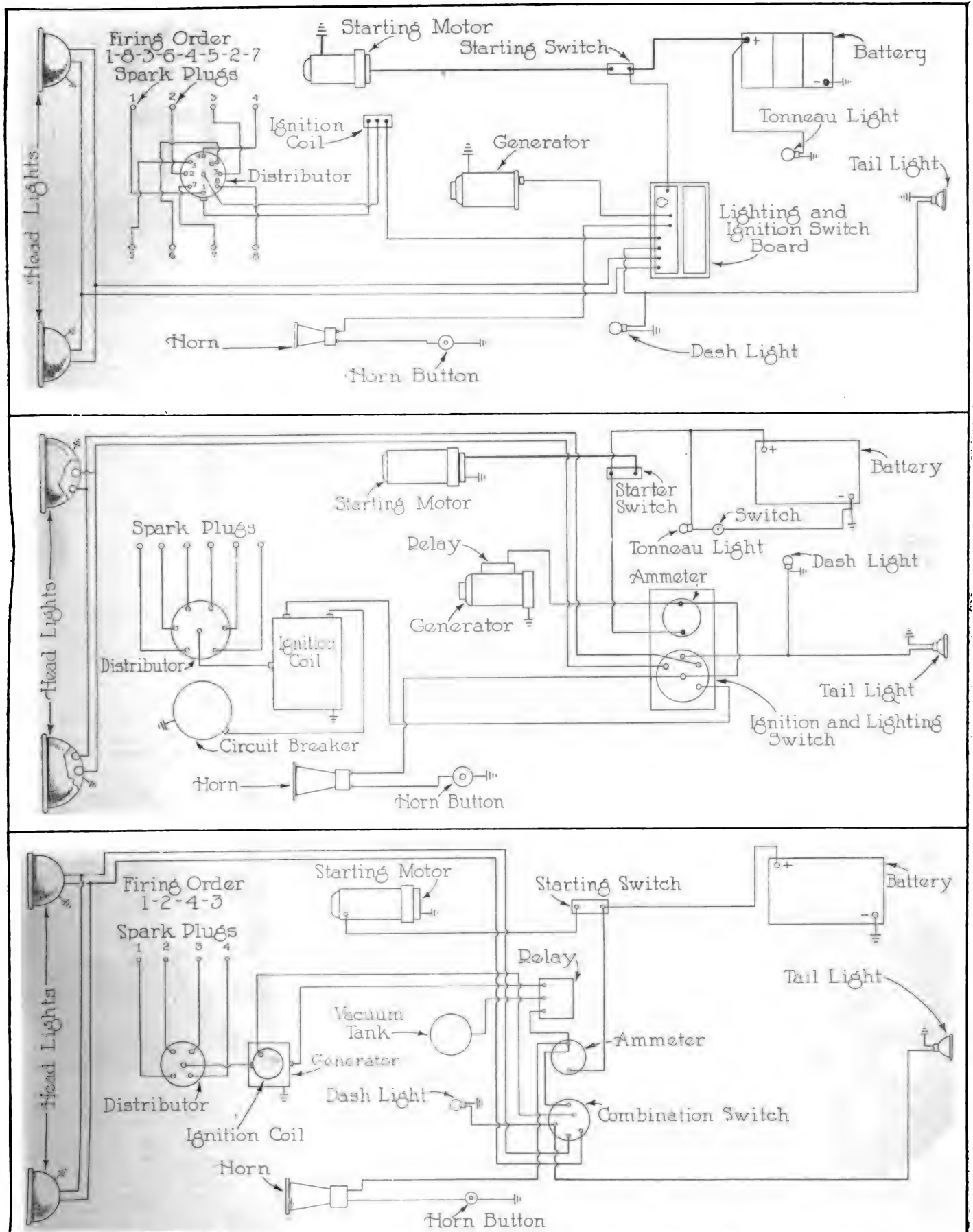
A FORM OF TORTURE.

It is a form of torture to have to drive slowly on a road where unlimited speed is safe and permitted. For instance, with a newly overhauled engine that calls for gentle treatment in the first 400 or 500 miles of running and where a speed of 20 miles an hour is better for the eventual welfare of the engine than some faster rate, to be turned loose on the motor parkway and have car after car flash by is a sort of teaser. However, it is to be observed that a steady 20-mile-an-hour clip in the course of 45 miles of the parkway picks up a great many of those that went by in a hurry.



Seven Simmons College Girls Have Been Cruising the Country This Summer on Unique Venture—When They Complete Their Vacation Tour of the East They Hope the \$2,000,000 Endowment Fund Which Their Alma Mater Is Out to Raise, Will Be Richer by Virtue of Their Efforts and Enterprise.

Monthly Wiring Diagram, No. 19



Top, 1918 Oldsmobile Model 45-A Eight-Cylinder, Equipped with Delco Single-Unit One-Wire System; Center, 1920 Oldsmobile Model 37-A Six-Cylinder, Equipped with Remy Two-Unit One-Wire System; Bottom, 1921 Oldsmobile Model 43-A Four-Cylinder, Equipped with Auto-Lite and Remy Two-Unit One-Wire System.

ACCESSORIES DEPARTMENT

The Merta Valve Spring Release performs the service for which it is designed in a simple, yet very effective manner.

The fork straddles the lower end of the valve stem, the sliding arm is dropped till the swivel button on end of thumb screw centers on the valve head. The sliding arm automatically locks on a vertical bar, thus leaving both ends free to turn the thumb screw and remove or insert the key or pin in the bottom of the valve stem.

The type of release shown in the cut, at the extreme left is the No. 7, which is adapted for use on all small motors, especially on nearly all Continental motors. It has a clearance of $7\frac{1}{2}$ inches.



The type shown attached to the cylinder block is adapted for most all T-head and overhead valve motors, having a clearance of $3\frac{1}{4}$ inches. No. 4, at the immediate right of the block, is particularly adapted for use on V-type motors, Fords and other small motors. Its clearance is $4\frac{1}{2}$ inches. At the extreme right is shown No. 9, for use on large trucks, tractors and passenger car motors having large manifolds. It has a clearance of nine inches from the center of the valve head to the vertical arm.

Distributed by the Rosier-Howard Corporation, Hutchinson, Kan. Prices on application.

The Smith Cushion Motor Truck Wheel is an improved type of the well-known Smith wheel, which employs a cushioning device between the tire and felloe band,



which eliminates road shocks and vibration of the road from reaching the chassis mechanism. This device consists of air pockets confined by cushion locking and retaining rims. The weight of the loaded

truck is, therefore, carried on the confined air which acts partially as a pneumatic load-carrying member, although air is not

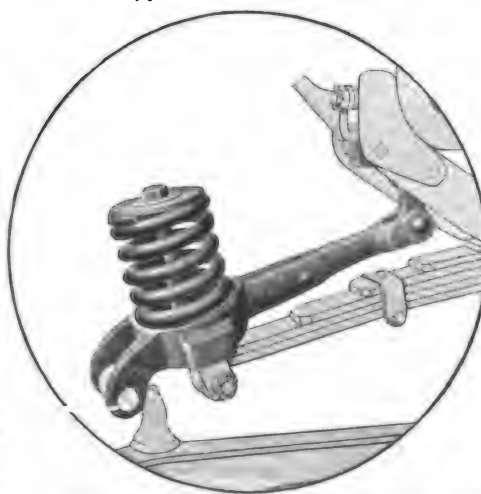


added to it from time to time as in the conventional pneumatic tire.

The Smith cushion wheel is made up of four units, namely, the wheel, cushion, steel locking rings and cushion retaining ring. When the four parts are assembled, they are held in place automatically and the wheel is ready to receive the pressed-on tire in the usual manner.

Manufactured by Smith Wheel, Inc., Syracuse, N. Y. Information and prices on request.

Drednaut Shock Absorbers for Fords are designed for the protection, comfort and convenience of the small car driver, as well as to afford economy in operation. Their action supplements that of the leaf



springs already on the Ford, and suspends the car on four large, strong coil springs of vanadium steel. These springs are more resilient than the stiff spring leaves; the rebound is not so sharp; there is no jerk—no shock to the body.

The shock absorber arm is connected directly to the chassis and body of the car by a shackle link. Between this connection and the one at the end of the leaf spring the recoil of the leaf spring, after flexing, is controlled by a neutralizing action through the coil spring and shock absorber arm to the body. Side sway and side roll are stopped by radius links. Top heaviness is reduced to a minimum, thus eliminating danger of tipping.

Drednaut shock absorbers do not interfere in any way with the engineering processes of the Ford engineers in the spring equipment used on their cars. No fittings or connections of any kind are clamped to or touch the leaf springs. The free action of the springs is not interfered with in any way—rather, it supplements their action, and makes the Ford ride easier.

Furthermore, there is protection for the leaf spring when Drednaut shock absorbers are used: it is impossible to bend them or weaken them in any way.

Authorized dealers will install a set of Drednaut shock absorbers on a Ford car for a 10-day trial. If, at the end of that time the customer is not absolutely satisfied with their performance the money will be promptly and cheerfully refunded.

Manufactured by the Auto Specialties Manufacturing Co., St. Joseph, Mich., and Windsor, Ont.

The Loomis Patented Ball Grip Handles for Ford car doors afford an increased convenience in opening doors on Ford cars. These new door handles are as ornamental



as they are useful. They are attached in a jiffy by tapping them on the regular handles. A light tap of a hammer is all that is necessary.

These new Ball Grip Handles offer especial trade attractions to the jobber and dealer, inasmuch as they require no service for installation, give no subsequent mechanical trouble and remain sold.

Manufactured by the C. F. Loomis Manufacturing Co., 428 Liberty Street, Peoria, Ill. Price, \$1.25 a set for the Ford touring car.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

The Quality Products Universal Test Bench, for holding, driving and testing all makes and kinds of automotive electrical units, is the latest creation of Mr. Has-kins, president of the Quality Electrical Products Co., and is stated by experts to be one of the most simplified, absolutely universal test benches on the market to-day. The cut shows the machine complete in the center, with inserts showing special features and equipment. At left top is shown the raised position and at right top the lowered position. At bottom, left, may be noted the speed indicating dial, which is a built-in unit, and at bottom, right, is the double quick acting holding vise.

ters as the four bars of the parallel bracket. These two universal joints are so assembled as to give absolutely uniform speed regardless of the angle through which they are operating within the range specified above.

The holding vise is double quick acting, both jaws being movable forward and back on a ratchet bar and guide rack, being locked with two follower dogs, which automatically hold the jaws from being opened up or drawn apart when they are closed on a machine. One of these following dogs is fitted with a hand wheel, which serves to firmly lock the vise jaws in position. To release the vise it is only



the large hand will have made one total revolution, and 30 seconds additional, and the small hand in the center of the dial will have passed the first sector, and show in the second sector, which is the black, and which denotes that the operation must be read in the black circle; and reading under the 30-second mark in the black circle the figure 277 will be noted. However, this figure being based on the observation of 10 operations, and only one operation having been timed in that period, it is necessary to point off one figure, and the result is then 27.7 operations per hour, based on one operation timed in 130 seconds. The same applies to operations of longer periods; the small hand moves in the colored sector, showing in which circle the large hand is operating, and makes it easy to calculate the elapsed time.

The instrument has the take-out time feature, which allows the operator to start and stop the watch without returning the large hand to "zero," and when an operation is entirely completed, pressing the crown down returns all hands to the starting point. The dial is divided in seconds and half-seconds.

The instrument is of a very sturdy type, designed for industrial purposes, and with the present endeavors to analyze and cut costs it should prove a valuable adjunct in every plant.

Manufactured by Mortimer J. Silberberg Co., People's Gas Building, Chicago, Ill.

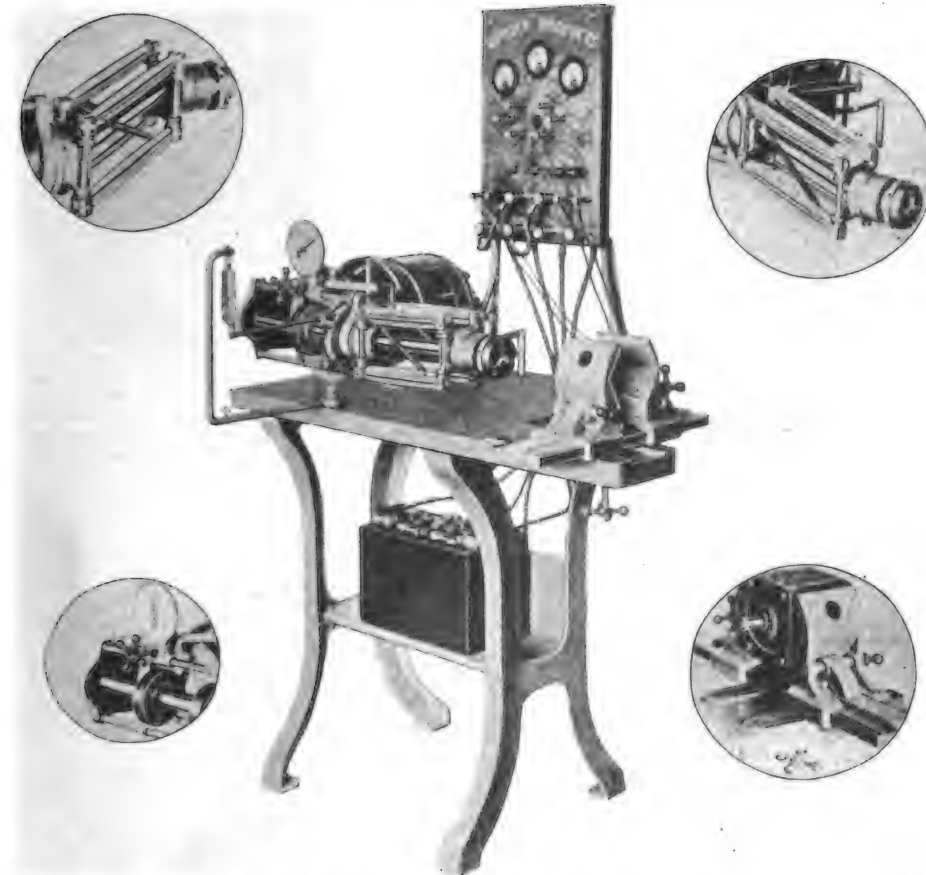
The Peerless Radiator Cap for Ford cars, which has just been placed in the market, is already proving a worthy addition to the well-known family of Peerless products for Ford cars.

This new radiator cap not only adds neatness and attractiveness to the front of a Ford, but it is extremely serviceable. It is made of the very best materials, is heavily nickel-plated and has all the wearing qualities and appearance of much more



expensive caps. The popular dumb-bell type handle makes turning easy and does not retain heat. It is non-leakable, rust-proof and will last as long as the Ford it is on.

Manufactured by the Corcoran Manufacturing Co., Cincinnati, O. Retail price, 50 cents.



The unique driving feature of this machine is obtained by the use of a four-bar, parallel bracket arrangement which holds the driving head and chuck in a parallel position in relation to the holding vise, at all positions through a vertical radius of six inches and a horizontal radius of 12 inches. This allows the machine being tested to be instantly clamped into the vise, and since the vise is free to move forward and back from the chuck, it can be moved forward to the chuck and without any raising or lowering of the machine the chuck can be moved into the plane of the shaft and be clamped to the same instantly, regardless of the height or position of the shaft in relation to this holding vise. The driving shaft, from the friction shaft to the driving head, is fitted with two universal couplings which have the same cen-

necessary to loosen the dog with the hand wheel, raise the dogs out of engagement with the rack and move them apart, releasing the machine. These features enable the operator to clamp, chuck and drive any kind or make of magneto, generator or starting motor in less than one minute's time, and as the chuck is free to move in any direction, there is never at any time any strain put upon the end cap or bearings of the machine being tested. Machines of this character are made to operate through flexible couplings and the die cast frames will not stand heavy strains which are at times imposed by some testing devices now being used.

Manufactured by the Quality Electrical Products Co., 915 East 15th Street, Kansas City, Mo. Price, less battery, \$400; less battery, switch panel and wiring, \$435.

The Duration Time Study Watch has been designed to meet the ever-increasing demands of the automotive industries for time and motion study equipment. It is fitted to handle the timing, analysis and observation of from one to 10 operations up to and including five minutes of duration.

The instrument illustrated has three circles on the face of the dial, the outer circle being in red, the center circle in black and the inner circle in blue. The large hand makes a total revolution of 100 seconds, and the small hand in the center moves over a red, black and blue sector, thereby showing in which circle the large hand is operating.

All of the figures on the face of the dial denote production per hour, based on the timing of 10 operations. As an instance: If 10 operations were observed to have elapsed in 20 seconds the figure under the large hand in the red circle would show 1800 operations per hour, based on 10 operations having been completed in 20 seconds. If, instead of 10 operations, one operation is observed to have lasted 20 seconds, then instead of 1800 it would be necessary to point off one figure with a decimal, and the result would be 180 operations per hour, based on one operation being completed in 20 seconds.

If an operation is timed and its duration is 130 seconds it will be noted that

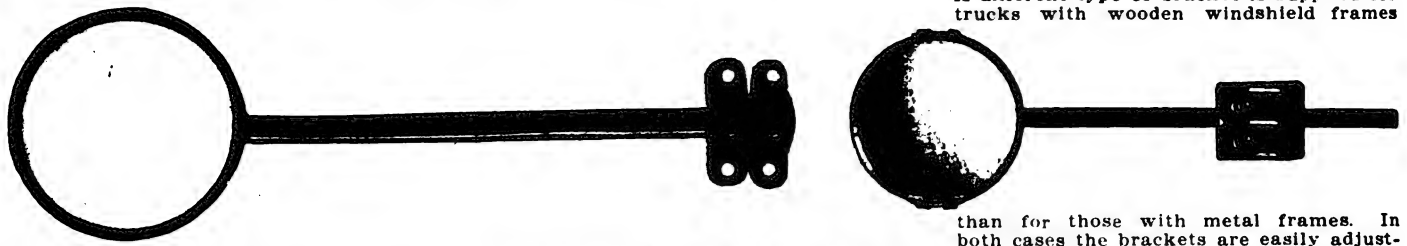
(When Writing to Advertisers, Please Mention the Automobile Journal.)

The Reflectoscope Truck Mirror is of late design and constructed for attachment so as to comply with the laws of practically

all states which enforce a mirror law. These mirrors are strongly made to withstand the vibration of the truck and will

not become loosened. They are broadly guaranteed by the maker and many thousands have been sold.

which permit the placing of the mirror far enough out from the side of the car as to give a clear view of the roadside behind. A different type of bracket is supplied for trucks with wooden windshield frames



all states which enforce a mirror law. These mirrors are strongly made to withstand the vibration of the truck and will

Manufactured by the Lawson Auto Specialty Co., Inc., 47-49 Bergen Street, Brooklyn, N. Y.

The Varispeed Governor can be installed on practically all makes of truck and tractor engines not already thus equipped. It controls the speed of the engine between certain limits.

In structural details the governor much resembles the conventional fly-ball type, having weights at each side of the center shaft which swing outward as the speed of the driven shaft increases. By means of levers and linkage the action of the weights is communicated to the butterfly valve in the engine intake manifold, ad-

just as it in a moment. Connections are easily made to the intake manifold or vacuum system, either by the driver or by a mechanic at a very small cost.

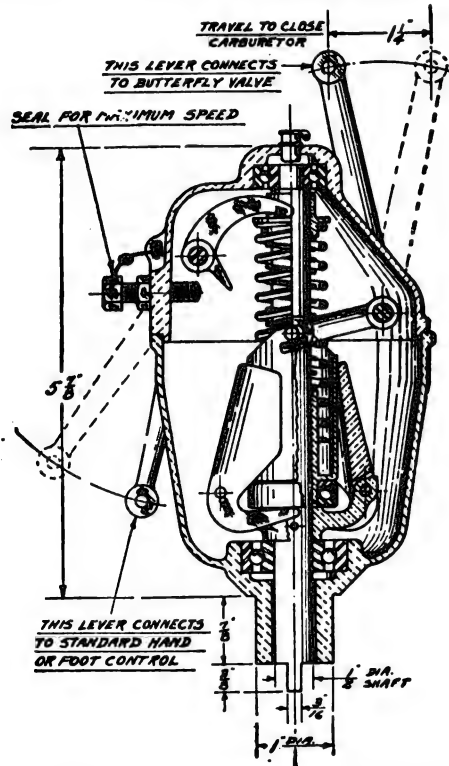
The Eveready is carefully packed, complete with the necessary fittings and full directions. Every unit is thoroughly tested

than for those with metal frames. In both cases the brackets are easily adjusted and stay rigid without chattering.

The back of the 4½-inch round bevelled plate-glass mirror used is coated with water-proof paint which effectively protects it from the weather and much rough treatment.

Autoglass mirrors are supplied with 4½-inch diameter mirrors and wood or metal windshield frame brackets with eight, 12 or 16-inch extension rods.

Manufactured by the Auto Glass & Mirror Corporation, Department D, 318 Jefferson Avenue, Buffalo, N. Y.

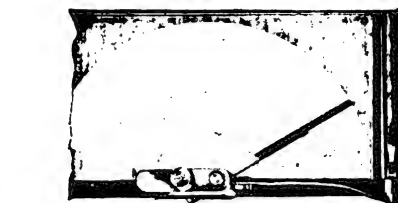


mitting more or less gas to the engine as required. A second lever is connected to the governor spring, and to the accelerator pedal in the control set. The action of this lever is to increase the spring tension, allowing the engine speed to be varied at the will of the driver. A sealed set screw, near the top of the governor case, limits the action of the governor and prevents the engine from racing.

Manufactured by the S-W-S Co., 716 Metropolitan Life Building, Minneapolis, Minn.

The Eveready Automatic Windshield Cleaner is a safety device that should be of utmost importance to every motorist. It operates automatically. Just turn the button in inclement weather and then forget it. It will keep clear a broad, clean arc on the windshield large enough to permit the driver to see everything about him. There is no cost of operation. Once installed it is always working.

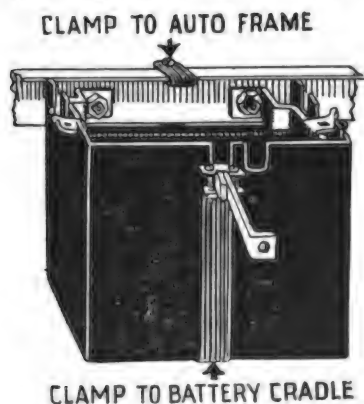
It is so simple to install that anyone can



and guaranteed perfect. The working parts are highly polished and nickel finished. Every part is built to last. The wiping arm, which swings to and fro, is made of non-corrosive material in which the high-grade flexible strip of rubber is imbedded. It wipes the glass clean and dry at every stroke.

Manufactured by the Apex Electric Manufacturing Co., 1410 West 59th Street, Chicago, Ill. Price, \$10.

The Hastings Heavy-Duty Ford Truck Tire Carrier is designed to carry one 32 by 4½-inch or one 33 by five-inch tire or rim and a 30 by 3½-inch tire or rim. It is stated to be made exceptionally strong and durable and is built to stand the rough



service required of a tire carrier on a Ford truck. It is fitted with the Hastings simple, fire-proof locking device, and is finished in high-grade, fired, black enamel.

Manufactured by the Hastings Manufacturing Co., Hastings, Mich. List price, \$8 each.

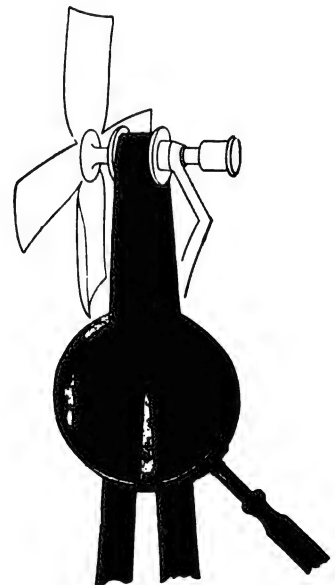
Autoglass Truck Mirrors give a beautifully clear reflection of the entire road behind. Often truck drivers cannot hear a horn from behind because of the noise of the engine. The car behind trying to pass might not be seen in an ordinary mirror as the cab of a truck is rarely as wide as the truck. A lot of accidents to trucks and other cars trying to pass trucks might be prevented and good feeling promoted by the use of the Autoglass bevelled plate-glass mirrors with long extension rods,

turn of the pulley the Vacuum belt drives the fan. A glance of a Vacuum Genuine Hog Hide belt under a magnifying glass will reveal, as in the accompanying illustration, the scientific reasons for less tension, more pull and longer life of this product.

Vacuum Genuine Hog Hide is tough and durable. It is unnecessary to stretch this belt to the breaking point to obtain traction—the vacuum cups take care of that. The vacuum principle eliminates the cushion of air between the fan pulley and belt—always present in ordinary belting.

The Vacuum Genuine Hog Hide fan belt is now being offered to the public in a new and individual package, which enables the dealer to display it prominently in his show case or window. Its size is convenient to be slipped in the pocket of the car as a spare. It is sold with a money-back guarantee.

Manufactured by the Vacuum Belting Co., Indianapolis, Ind. Retail price, 75 cents.



(When Writing to Advertisers, Please Mention the Automobile Journal.)

The Laurre Friction Clutch Pulley is especially designed for use on tractors and stationary gasoline engines, and is claimed to be positive in action, convenient to handle and durable in use.

All working parts are enclosed in a neat, compact casing, which is also a part of the clutch mechanism. There are no surplus screws or parts to get out of order. A single screw compensating adjustment, easily accessible from the outside, amply provides for taking up wear.

The clutch is easy to operate, has a powerful, smooth grip, and positive clear release. The friction surfaces and bear-



ings operate in an oil bath, and a fresh supply may be inserted without stopping the engine, if desired.

The illustration shows a three-quarter view of the assembled pulley, depicting the adjustment screw extending to the front of the housing, where it is easily accessible without removing any part and can be reached with a wrench, screw driver, nail or file tang. The socket provision on the hand wheel for connecting the shifter lever may be utilized in case the engine is located near a wall, or when it is desired to operate from a distance.

Manufactured by the Laurre Friction Clutch Co., Watertown, Wis.

Hastings 100 Per Cent. Piston Rings are individually cast and machined with micrometer accuracy, it is stated. Each ring is tested for perfect concentricity in a ring gauge before being packed, and nothing but perfect rings are shipped.

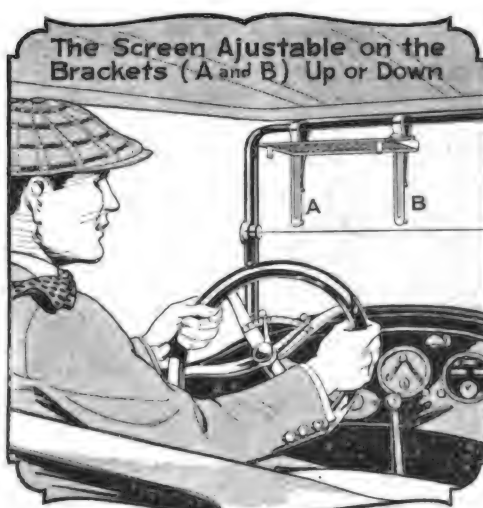
Hastings 100 per cent. piston rings are heat treated in manufacturing so, it is claimed, there is no chance of their being



affected by heat from the motor. These rings are made heavy, giving them resiliency and long life.

Manufactured by the Hastings Manufacturing Co., Hastings, Mich. List price, 25 cents each.

Custer's Auto Glare Dimmer is a new device designed to make automobile driving by night entirely safe and promises to



be a quick seller in the automobile trade. This device fits on the windshield and filters the blinding glare of approaching head lights and the driver has a perfect clear vision of the road ahead at all times. It matters not how powerful the coming lights may be, the car operator's view is stated to be absolutely clear and he may drive in perfect safety and at any speed, so far as the head light glare factor is concerned.

The Custer Auto Glare Dimmer is made of metal, the frame being of spring brass, strong and substantial, the dimming effect being obtained by the use of a special woven bronze screening of very fine mesh, the whole being heavily nickel plated. It fits any make of car and is instantly adjustable to the height of the driver, and can be raised or lowered as desired. When not in use a touch of the finger flips it out of the way and, on the approach of another car, a touch brings it into position again. It is fitted with rubber bumpers, so both operations are absolutely noiseless. It fits tightly and cannot rattle.

The Auto Glare Dimmer is small and weighs only eight ounces.

Manufactured by the Ray Filter Co., Marion, Ind. Information and literature on request.

The B-X Battery Protector is a heavy metal box, durably and handsomely fin-



ished in baked acid-proof enamel, the last word in protection against battery acid. It is applied in a jiffy without removing or even disconnecting the battery. It slips up freely over the battery, cradle and all, and even over a battery already warped and swollen. It cannot rattle the box, being securely supported to the cradle only and does not even touch the battery. There is plenty of air space all around it. The lid is held firmly in place by patented spring clamps and can be removed in a few seconds. Supporting handles are provided at the ends which hold the box in posi-

(When Writing to Advertisers, Please Mention the Automobile Journal.)

tion in the car or truck chassis, while extension arms at the sides provide for battery support in the chassis.

Manufactured by L. C. Millner, 148 East Georgia Street, Indianapolis, Ind. Prices and literature on request. If jobber cannot supply motorist in any locality, he is invited to write to the manufacturer direct.

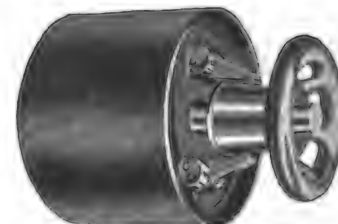
Richmond Piston Rings are hammered by a patented electrical process called the Lune, which compresses the metal, forming a ring which, when fitted in an engine cylinder, creates a perfect seal between the piston and cylinder wall, increasing the power of the engine and preventing waste of oil and gas.



A particular feature which the manufacturer especially mentions is that the rings seat quickly after being installed on the pistons, conforming to the shape of the walls of the cylinders after a few hundred miles of road driving. An oil scraper ring is often necessary to prevent oil passing and, upon the degree of tightness of the rings in the cylinders, depends whether one or two scraper rings are to be used per piston.

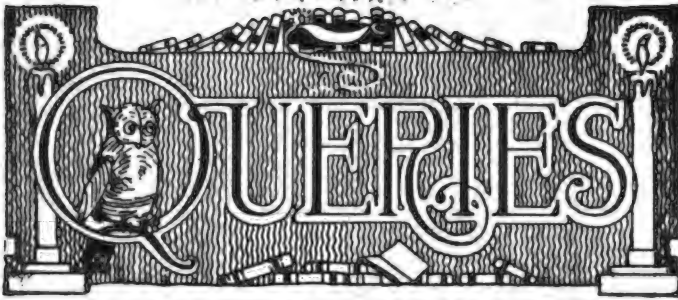
Manufactured by the Richmond Piston Ring Co., Richmond, Ind.

The Menasha Clutch Pulley has been developed for tractor use. This pulley differs from conventional types in that friction is gained by the use of metal discs in multiple quantities operating in an oil bath. Additional pulling power can be gained by the addition of extra frictional plates. When the hand wheel is pulled out or engaged, it brings pressure to bear on two head pins opposite each other, which in turn, force a heavy cast-iron presser ring against the steel friction plates. These friction plates, being forced against each other, create a terrific pressure, securely locking the plates and creating a friction clutch of enormous pulling power. Pushing in the hand wheel causes the discs to free themselves, a number remaining idle with the pulley while the balance rotate with the hub or shaft to which the



pulley is attached. By the use of an oil bath friction is eliminated while the pulley is idle and the life of the pulley is, therefore, greatly lengthened. By turning the head of the pulley further into the housing it tightens the clutch, and in this manner the pulley may be adjusted to any desired horsepower.

Manufactured by the Menasha Clutch & Machinery Co., Menasha, Wis.



FORD REPAIRS.

(G. W. S., White River Junction, Vt.)

I would like to have you tell me about repairing my 1915 Ford car. Is it all right to grind in new piston rings? There never have been new ones fitted. How much space should there be between the push rods and the valve stems when the valve is closed? How much space should be between the magneto and the magneto field? It does not run as close as it did originally and would it make any difference about delivering a hot spark? How is end play taken up? Why should my Ford engine when I start it and let it idle, almost come to a stop? I have to prime it to keep it running, but if I put it under load it will usually operate all right and give good power.

A car that is as old as this one and has been used as much probably will need considerable repairs and it might be worth while taking the parts to a regular repair shop unless you are familiar enough with them to do the work yourself.

New piston rings are probably very badly needed. Fitting them to the piston and cylinder is quite a job. A new ring should first be fitted to the piston so as to be certain that it will slip into the groove, being careful that the ends will not butt against each other when the piston is put into the cylinder. It may be necessary to file down the size of the ring very carefully in order to enable it to slip into the groove. Even when the ring fits into the cylinder there should be a little clearance between the ends so as to provide for expansion caused by the heating of explosion. A 1/64-inch opening is all right.

Then the ring should be lapped into the cylinder. One way of doing this is to take a plug of soft wood which fits easily into the cylinder, slip the ring over one end, holding it by a cleat secured by a screw. Smear the inside of the cylinder as evenly as possible with a mixture of lubricating oil and red lead. Then work the ring back and forth and around in the cylinder. High spots in the ring will, of course, be very evident and they should be carefully filed down with a smooth file. As soon as contact all around is accomplished, then the ring is ready to be put on the piston.

The clearance between the push rod and the valve stem should never be greater than 1/32-inch, nor less than 1/64-inch measured when the push rod is on the low part or heel of the cam. If the rods are badly worn, new caps may be necessary and they should be very carefully fitted in with a proper clearance.

The space between the magneto and magneto field should be just as small as possible without interfering with the rotation field. The greater the space the weaker will be the current and, of course, the spark will be similarly weakened. A thin washer slipped in over the end of the crank shaft at the outer end should take up the play and reduce the clearance.

In regard to the Ford engine which is giving trouble, the chances are that it is badly worn and when the engine is idling and going very slowly it may not draw up enough gasoline past the needle valve in the carburetor to keep it going. When the engine is fully loaded and is operating at normal speed, more gasoline is drawn in the cylinder and there is no trouble in keeping up the impetus of the moving parts so that it will go over every dead center successfully.

BATTERY AMPERAGE.

(J. O. G., Boston, Mass.)

Is it possible to determine the amperage of a storage battery by the size and number of the positive plates and, if so, how?

The capacity in ampere-hours, the safe charging rates and the recommended discharge rate for steady service are all in proportion to the size and number of the positive plates or, in other words, to the area of the active plate surface, but none of these things can safely be determined merely by counting the plates and noting their size, although in comparing two batteries of the same make the capacity and amperage would be nearly in proportion to the plate area. The name plate is usually the best guide and there is usually stamped upon it the ampere-hour capacity and the start and finish charging rates in amperes. Discharge rates are not marked on vehicle batteries. The manufacturer of any particular type of battery can give you full information regarding these matters.

TO TEST BRAKES.

(G. O. P., Santa Rosa, N. M.)

Please tell me how to test my brakes on my American underslung, which is a 1914 car? The grit and dust down here make constant brake relining necessary and I invariably get them too tight on the right wheel.

Jack up both rear wheels, put on the emergency brake part way, and test each wheel for equal resistance. Tighten up the loose side so that the resistance is equal, but do not set the bands up far enough to drag on the drum.

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Classified Advertisements Pay.

HIGH-TENSION DISTRIBUTOR OR TIMER.

(T. K. G., Philadelphia, Pa.)

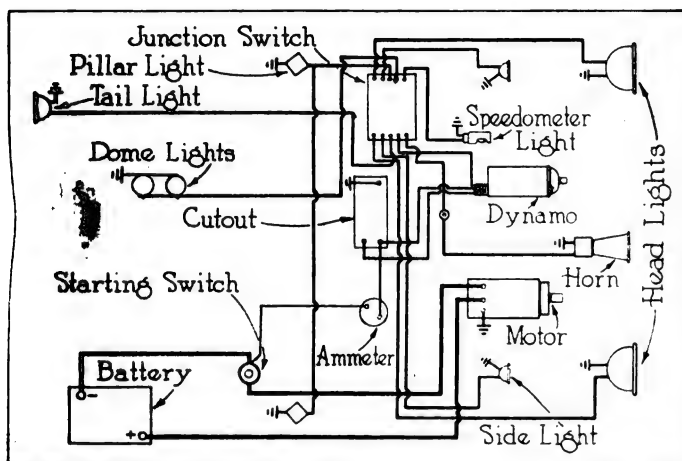
I am somewhat uncertain of the definition of terms "high-tension distributor" and "timer." I would like to know if these both denote the same part or are separate units.

High-tension distributors and timers are entirely separate units. The timer is used in conjunction with a low-tension current and merely serves to interrupt the primary current at regular intervals. With this device it is necessary to use a transforming coil, as the current supplied by the battery is not of sufficiently high potential to jump the air gap at the spark plug. The high-tension distributor is used to distribute a current of high voltage to the several plugs at the proper intervals. While the purpose of the two is comparatively the same, that is, to deliver the current to the cylinders in the proper firing order, yet the two are used on entirely different systems.

OVERLAND MODEL 79.

(W. T. B., Chicago, Ill.)

Kindly publish in the Query column of the Automobile Journal a wiring diagram of the Overland Model 79 equipped with Gray & Davis electrical system.



The wiring diagram is shown above and gives an idea of the units used and how they are wired. Grounds are indicated on the frame of the car and the units of the system are clearly outlined.

TIRE VALVE MAY LEAK.

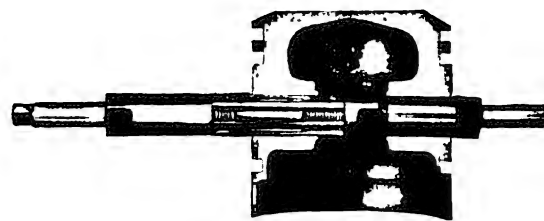
(E. Mc., Minneapolis, Minn.)

My tire needs constant re-inflation. I have carefully examined the tube, but can find no leak. The valve seems to be all right. What could be the trouble? I am a new car owner and probably somewhat slow to learn.

When a tire requires frequent re-inflation, revolve the wheel until the valve stem is at its highest point, remove the cap, fill a tumbler full of water and hold it so that the valve stem projects into the liquid. If the tire still contains air and bubbles are seen escaping through the water, you have a valve leak, which may be caused by the plunger not being fully screwed into place, which is done by fitting the slotted end of the cap into the valve and catching the rib of the valve plunger at the top, turning to the right to tighten. If the leak still persists, showing bubbles, the valve must be screwed out, discarded and replaced with a new valve.

If the rubber packing in the cap has become loose and is turned on edge, it sometimes strikes and unseats the plunger when the cap is screwed on, causing leakage to occur. Frequent changing of valve insides is advisable. The tube may also leak at the point where the valve stem is fastened to the tube. Tightening the stem nut sometimes stops it.

(When Writing to Advertisers, Please Mention the Automobile Journal.)



With Two SUPER-SIX LINE REAMERS

(Nos. 745 and 875)

you can ream the wrist pin bushings of all Ford models, and nearly 120 other makes and models of cars.

Think what a saving that means on the cost of buying solid reamers capable of handling the same range of work.

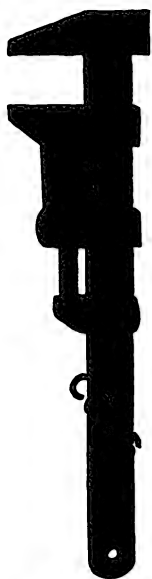
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All dealers carry in stock the exact size to meet your need. They recommend Coes Wrenches as all good dealers have for more than fifty years.

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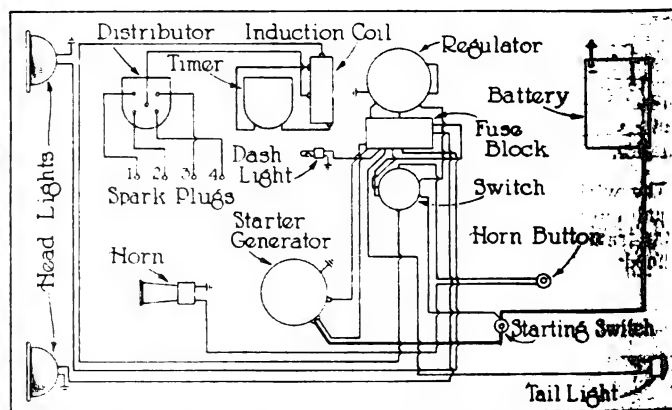
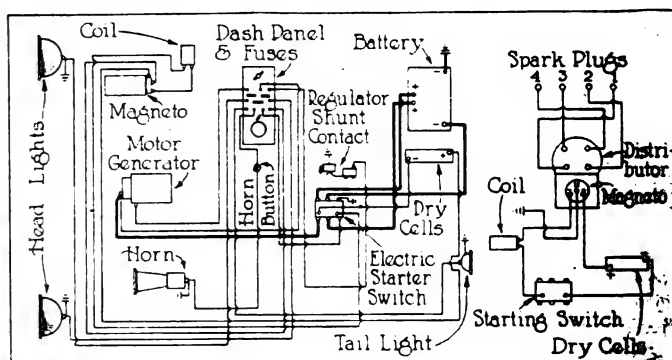
REGULATOR POINTS NEED CLEANING.

(J. W. G., Buffalo, N. Y.)

Kindly give me, through the columns of the Automobile Journal, wiring diagrams of the 1916 and 1919 Maxwell cars—the 1916 equipped with Simma-Huff starting and lighting system and Simms magneto. Four dry cells are used in starting the engine and I have trouble in using the starter, but when cranked the engine responds quickly.

The 1919 Maxwell seems to have a generator trouble which I do not understand. The regulator points stick and, when the engine is stopped, the generator keeps on turning, but will show no charge when the engine is operating. Why should this be?

Your starting trouble with the 1916 Maxwell is probably due to a weak storage battery, which is not able to turn over the engine. When started by hand the dry cells supply the current for ignition, starting the engine immediately. Maxwell service stations are at present removing the magneto, replacing it with a distributor head, coil and switch, which is wired into the starting and lighting system in such a manner that the system supplies ignition for the engine.



The trouble with the generator on your 1919 Maxwell is probably either poorly fitting brushes, worn brushes, dirty commutator, or that the mica between the segments is too high, which prevents the brushes from making contact with the segments of the commutator and completing the circuit of the coils.

To obviate this trouble, the armature should be removed and turned down in a lathe. The mica insulation should also be cut below the segments and this is best done with a piece of hack saw blade fitted with a wooden handle. Cut the mica lengthwise between the segments for a slight distance below the top edge of the segments.

Pressing the regulator points together allows the storage battery current to seep back into the generator, rotating it as a motor. Sticking or dirty points will cause this to happen and can be eliminated by smoothing down the points slightly with a piece of worn sandpaper, number 00 size. After the points are smooth and the dirt removed, run a strip of paper through between the points in a similar manner to remove dust or dirt left after sandpapering.

We would advise you to take either of these cars to a Maxwell service station and have the necessary tests and repairs made to put the units that are defective in proper shape.

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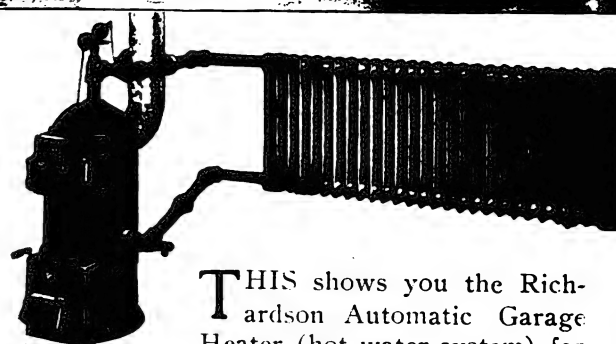
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AUTOMOBILE JOURNAL

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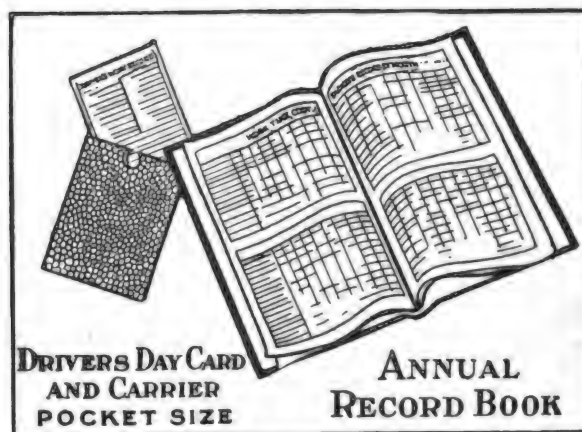
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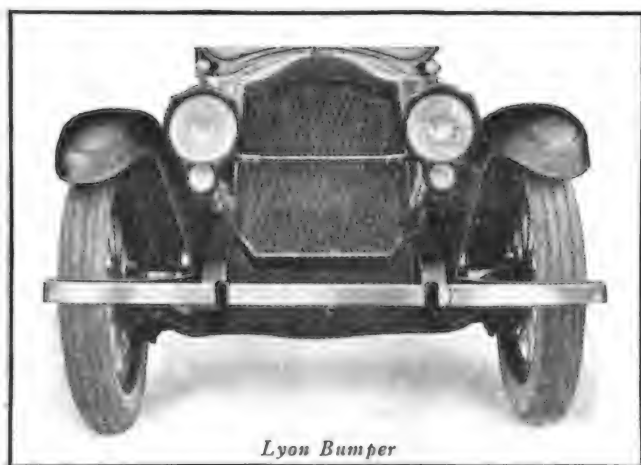
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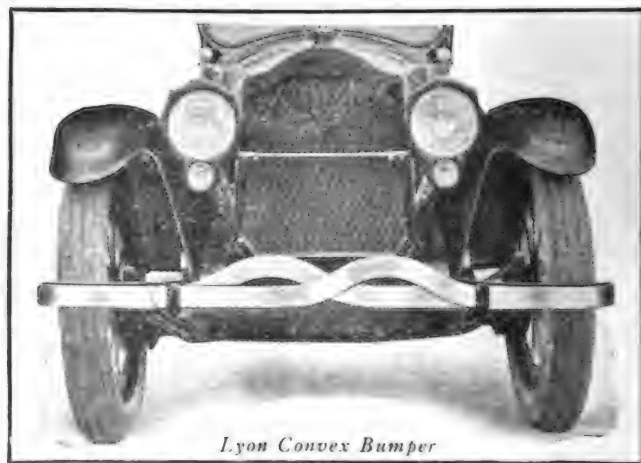
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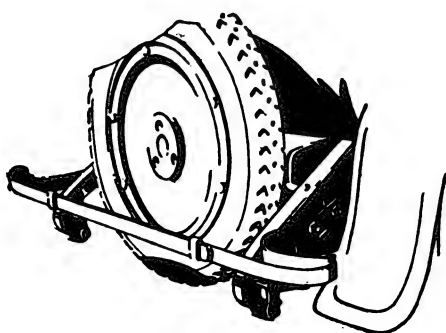


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THE AUTOMOBILE JOURNAL

VOL. LXIX.

PAWTUCKET, R. I., OCTOBER, 1921.

NO. 3.

Adaptability of Radiophone to Motor Vehicles

Enables Tourists to Keep in Touch with Homes and Business
—Fleet Owners Find It Useful in Tracing Movements of Trucks; Commercial Houses in Routing Salesmen.

THE motoring public may have read in the newspapers and magazines devoted to new mechanical and electrical ideas, descriptions of vehicles controlled by a new element called Radio, which is able, at the will of the operator and at a distance from the object so controlled, to make the vehicle perform in a manner similar to that when an operator is aboard and operating the vehicle himself. Small automobiles have been used in an experimental way for this purpose and in some instances larger models which very nearly approach the conventional sized passenger car. Such vehicles are equipped with the necessary instruments for controlling the vehicle and closely resemble those used by the operator.

The United States government has accomplished much in this line and uses the principles of radio control to manoeuvre obsolete war ships employed for targets in big gun practise. The operator and the set of instruments controlling the movements of the vessel are usually located on a second vessel, which is kept at a safe distance from the target and all the movements of the target, which may include turning in a circle, going ahead, backing up, changing speed, from slow to fast, etc., are entirely at the mastery of the operator.

Wireless or radio telegraphy has been

in use for some years, and practically every high-school boy is more or less familiar with its working principles. As soon as the boy gets interested in the subject he rigs up a wireless set at his home with antennae on the roof of the house and suitable instruments in his room, usually home-made, but often purchased, and receives great enjoyment from listening in to the talk of other

Morse code of dots and dashes and for this reason is more adaptable to stationary outfits than for portable use. Although some operators who are particularly skilled, have made portable sets which can be transported in a suit case, such outfits are more of a novelty as their working radius is short.

Many amateurs have shown great ingenuity in making their instruments, and

this has naturally caused improvement and advancement in the older forms, forcing manufacturers of this type of apparatus to devise and offer for sale instruments and apparatus that are up to date.

Radio operators in all parts of the country are becoming more or less interested in the newer form of wireless and are studying and experimenting with the latest, the radiophone, a form of *inter*-communication without connecting wires. That it will not conflict with the usual form of telephone service using wires either now or

in the future, is a foregone conclusion because it occupies a field entirely separate from the older form using connecting wires, and large telephone companies are already established to handle the business of cities and towns, which the radiophone cannot handle. Again the radiophone loses its acoustic powers in large cities on account of the number of steel frame buildings that absorb its current, weakening the tone and



Ford Coupe Owned by Mr. Giblin, Pawtucket, R. I., Equipped with Radiophone Receiving Set Capable of Receiving Messages a Distance of 150 Miles from Sending Station—The Antennae Are Strung Only a Few Inches Above the Coupe Top.

school boys in his immediate vicinity or, if his instruments are powerful enough, he may be able to attune them to the right pitch and hear conversations of the major government stations.

Each state has an ever-increasing number of amateur wireless operators and the call for instruments to fill this demand tends to show the interest taken in this subject by young America. The conversation is carried on entirely by the



Mr. Giblin Demonstrating the Radiophone to the Writer—This Illustration Gives a Good Idea of the Manner in Which the Antennae Are Attached.

preventing it from functioning at its best.

During the war great strides were made in both radio telegraphy and radio telephones, especially in the latter, as they were used largely between isolated points of observation for sending and receiving orders from headquarters. Messages were sent in code form that were not readily translated by the enemy and the usefulness of this form of telephoning was amply demonstrated.

In its improved form and simplified apparatus radiophone messages may now be sent practically any distance without the use of wires, depending simply upon the sending voltage and the ability of the receiving instruments to receive and make the message clear.

Principle of Operation.

Throw a stone into a pond of water and waves radiate out from the point where the stone entered, spreading in all directions till they eventually reach the shore or are lost in the larger body of water. Cause a spark to jump a gap in the atmosphere and waves of like nature are set up which travel in like manner from the point of contact. The ether of the atmosphere is the medium which transmits wave movements, caused by the electric spark to travel with the velocity of light to distant points, the distance travelled depending upon the amount of initial motion or the intensity of the spark. For this reason sparks of high frequency, voltage or pressure are required in wireless telegraphy or wireless telephony. The intensity of the spark determines the wave length, while the calling or called station depends upon a certain tone to the wave for sending and answering and is termed tuning; that is, one station will have a certain tone which it uses in sending and receiving messages, while another station to receive the messages must meet that tone exactly to receive the message.

Heretofore it has been necessary to have large generating sets and high towers to carry the antennae for transmitting the messages over long distances. These are still necessary in the large inland stations owned by the United States

and foreign governments, but for the smaller installations of amateurs the masts carrying the antennae are not as high, but the results are sufficient for experimental purposes. Powerful coils composed of many turns of copper wire are used to raise the voltage given by the generator to a sufficient height for transmitting the message, and coils of equal power are used at the receiving end.

Wireless telephony, on the other hand, does not demand such expensive equipment, as the wave lengths are shorter and high masts are not required. In fact good results have been obtained by burying the antennae wires in the ground, having several of them run in different directions so that it is possible to pick up a message from any point of the compass. A switch, connected to each wire by contacts and a revolving arm makes contact with the connectors, providing means of selecting the wire which points in the right direction.

Developed Duo-Lateral Inductance Coil.

A young man who is very much interested in this subject and who has done much to further the cause is Thomas P. Giblin of Pawtucket, R. I., who is responsible for the development of the Duo-Lateral inductance coil.

Radiophone Adapted to Motor Vehicle Service.

The honeycomb wound coil, contrary to popular belief, is not a new invention, as approximately 15 years ago it was conceived and samples were actually made.

The unique machine which winds this type of efficient inductance is manufactured by the Universal Winding Co., an eastern concern, which is primarily the maker of textile winding machines, which include apparatus to accomplish the winding of everything from fine silk thread to heavy rope, as well as wire. Who would believe that this famous inductance coil was in any way connected with the ordinary cotton yarn winding machine? Shortly after the war started the "bank" form of winding made its entry into commercial radio apparatus. The winding was literally snapped up on account of its small distributed capacity

within a minimum space area. Its great fault, however, was that the inductance made after this fashion had to be wound by hand, which proved very costly.

The sudden demand for radio receiving apparatus forced manufacturers to seek some method of winding the coils by machinery. This problem was submitted to the Universal Winding Co. and was neatly solved by the use of one of their winding machines. Mr. Giblin, an electrical engineer, a real and enthusiastic radio amateur, being connected with the company, took up the matter of this proposed bank winding machine and after careful study and experimentation with the assistance of mechanical experts, decided that such a machine could not be developed in the limited time allowed by the government; the primary consideration being to manufacture great numbers of receiving instruments as soon as possible for use during the war emergency.

After the armistice was signed, late in 1918, one of the large radio manufacturers became desirous of bringing out new apparatus. Experts were sent East and the subject of the basket wound coil was again taken up. Mr. Giblin was not to be again side-tracked in his belief that this type of coil and method of winding would prove effective for radio work, and continued his experiments so that in February, 1919, he developed the first practical honeycomb coil.

After a number of exhaustive tests at the Bureau of Standards and leading radio colleges, as well as by large radio manufacturers, several designs were perfected, making this type of winding most suitable and effective for short and long wave reception. Several months after the fame of the honeycomb coil had travelled far and wide and as an example of its highly successful commercial value, it has been estimated that from July, 1919, to April 1920, approximately 80,000 coils were distributed throughout the world. At present over 12,000 coils are being sold each month.

Duo-Lateral Inductance Coil a Decided Improvement.

Not being fully satisfied with the characteristics of the honeycomb coil, the inventor later brought out a new type of inductance called the Duo-Lateral, which is stated to by far exceed other coils in efficiency. Although this later coil much resembles the former, it has decided electrical advantages, and these are made possible through its peculiar mechanical construction.

Laboratory experiments at reputable colleges and also by reputable manufacturers, have proved that this coil, in comparison with other similar types, has 15 per cent. less distributed capacity, 12 per cent. more inductance, as well as $7\frac{1}{2}$ per cent. less high-frequency resistance and natural period. Not only this, but it is much smaller in size for given distance than any machine wound coil on the market.

These inductances can be wound to any size and shaped to any desired inductance. This is on account of its mechanical construction, whereby greater inductance can be secured and, owing to its regulated construction, it is a very strong, compact unit.

The Duo-Lateral coil differs from the honeycomb coil winding in that the alternate layers of wires are positioned above and between the wires of the lower layer in the former and parallel with the wires of the lower layer of wires in the latter.

In recent tests with a Mexico City radio station, it was found that on a wave length of 4500 meters the signals were 100 per cent. louder than given by other existing types of inductance coils.

The Duo-Lateral inductance coil has attracted the attention of the "Big Three" (the three largest radio manufacturing companies). Dr. J. H. Rogers is at present using them in connection with his underground circuit, and is also employing them in his experiments to determine whether or not Mars is signalling the earth.

Signals, barely audible, and in some cases inaudible, are easily readable with the Duo-Lateral coil, which marks this as undoubtedly the greatest step forward in the radio art since the introduction of the vacuum tube.

By means of several of these Duo-Lateral coils, together with one or two variable condensers and a vacuum tube unit, it becomes possible to receive a high range of signals, it is stated, and to cover exceptional distances. In brief, such a combination represents the ultra-efficient in radio receiving with or without amplification.

Tests Radiophone with Coupe.

Mr. Giblin recently equipped his Ford coupe with a radiophone outfit and demonstrated to his friends the possibilities of this form of telephoning.

Tests took place recently at a local battery station owned by Harry Hanlon, a man well versed in electrical work through long years of practical experience on storage batteries and steam engine practise for the local trolley company. The Ford coupe was driven into the basement of the station and conversation carried on between Mr. Giblin's home and the receiving set in the Ford coupe. An ordinary house radio receiving set was used, and the conversation was unusually clear for the short distance transmitted, about a mile, and the fact that more or less noise from the street interfered. The sound of the voice was distinct and so intense that it was necessary for Mr. Giblin to hold the receivers away from his ears to hear with comfort.

The car was next driven out of the city for several miles and communication again established with Mr. Giblin's home. The voice at the receiving set in the Ford coupe was heard clearly and without the sharp tones experienced in the battery station. To still further test the abilities of the phone the car was driven due east to Middleboro, Mass., a distance of about 30 miles, and the resulting conversation between the two points was transmitted more successfully than at the shorter distance. The following day the car was driven to Plainville, Mass., a distance of about 20 miles, and the experiment was repeated. Connections were easily established and the conversation heard as clearly as at the 30-mile distance of the day before, proving that the radiophone worked better at longer distances than it

did near by. Although tests were not given at this time to demonstrate the full limit of the 'phones, confidence is expressed by Mr. Giblin that it would easily answer for establishing communication between points 150 miles apart, as for instance, between truck drivers away from their home office on trips.

The receiving set used in the Ford coupe was a house set somewhat larger than required for radiophone work in a car or truck, and is capable of being reduced in size and still retain its ability to receive over the distances specified. To install a transmitting set to be used in conjunction with the receiving set would probably cost in the neighborhood of \$150 for a direct current generator of sufficient size to generate current of sufficient voltage for transmitting.

As stated above two factors enter into the successful operation of the radiophone, one being the voltage of the generator, which must be a direct-current machine of about 350 to 500 volts capacity and the other the amperage which, in the case mentioned, is about .5 of an ampere.

The current necessary to operate the receiving set in the Ford coupe was taken from the storage battery of the car and for the short time that the conversation was carried on caused very little drain on the battery; so small in fact that it was unnoticeable.

The antennae were conveniently located on the top of the car, but seven feet from the ground, and the car was necessarily insulated from the ground by the four rubber tires. No ground connection was used in any of the tests and it was found that conversation was carried on successfully without it.

Mr. Giblin feels that he has added something to the benefits of mankind by the results thus far obtained. He has been an enthusiast in this subject for a number of years and although still in his thirties, he has wide experience in government wireless service and has been a deep student of all that is going on in the wireless world. Mr. Giblin is at present

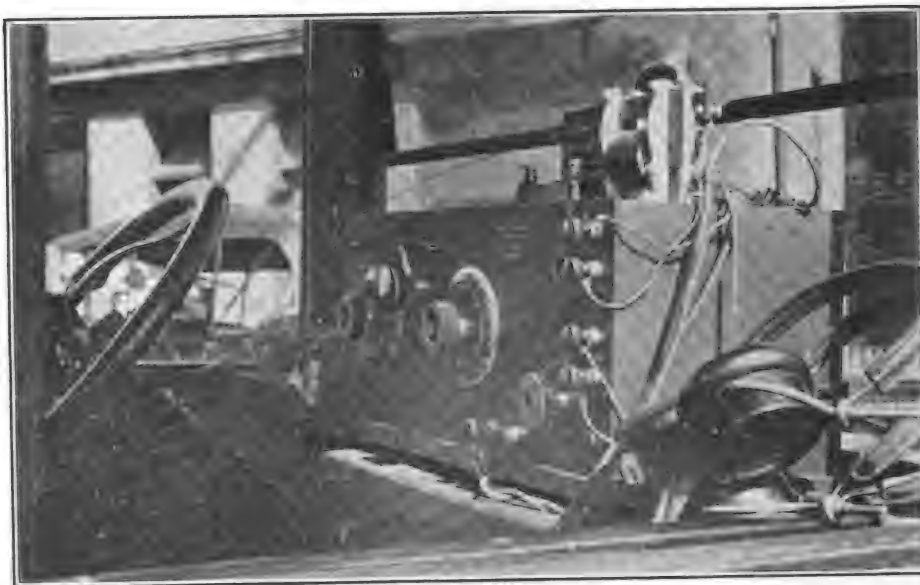
superintendent of the Standard Radio & Electric Co., Pawtucket, R. I., manufacturer of small electrical units, including cut-outs for automobile wiring systems, storage batteries, radio coils and units of various descriptions. His prediction that great strides will be made during the next five years in radio work compels more than passing thought of this, the latest and newest science which is interesting mankind both old and young. He states that he feels very sure that the radiophone will be very generally adopted and widely used by motor vehicles because it reveals opportunities heretofore considered impossible and opens a wide field of usefulness for radio apparatus of the telephone type.

The Ford Motor Co., through its local state agent, Dutee Wilcox Flint, has become very much interested in this project, as a Ford coupe was used for the experimental work. What this will eventually lead to cannot be predicted, but one can conjecture that it will be their endeavor to interest commercial houses in the possibilities to be gained by equipping Ford salesman's cars with radiophones so that the house sales manager may be in constant touch with his salesmen while on the road. The benefits of this feature are readily understood when one realizes that salesmen for commercial houses are often on the road for weeks at a time and often far from points of communication with the home office.

Doctors are often wanted out of office hours when they are making their calls. With a radiophone installed in the office and a similar set in the doctor's car it would be a simple matter to summon him in emergency cases. Fleet owners often wish to re-route their trucks from some distant point; this is now often impossible, but the radiophone with its wide range could quickly locate the missing truck, deliver its message and send the truck and its driver to a point designated where additional work is available.

Other Uses for Radiophone.

The Westinghouse Electric Co. quite recently mounted a sensitive wireless re-



Receiving Set Occupies but Little Space in Coupe at Right of Driver—The Sensitive Receivers Are at Extreme Right, While Knurled Buttons on Front of Set Enable Operator to Tune It to Correspond with Transmitting Set—Wire at Left Connects Antennae with Set.

ceiving outfit on a motor truck using a loop aerial as antenna. The truck is driven parallel to a high-tension power line to discover the leakage of the insulators. Wherever there is a bad leakage the crackling sound in the receivers of the radio outfit will quickly reveal the energy going to waste. An insulator may look all right from the outside, but it might be porous and thus waste a lot of the company's power. The radio receiver will instantly detect the bad insulator. Power companies in the West are now opening and closing switches in distant sub-power plants by radio. Instead of keeping an operator at each sub-station to throw the switches in and out, this is now accomplished without the touch of human hands.

Other possible uses will suggest themselves such as trailing stolen automobiles by sound, pursuing automobile thieves, detecting bodies of mineral ore, hidden treasure and large bodies of oil. These are just a few ideas and methods of working them out will no doubt occur to radio operators as a better understanding of the possibilities is gained.

Radio to Broadcast Government News.

Farmers and many others scattered throughout the United States may now enjoy the benefits of the radio telegraph and radiophone in receiving government market reports and other information which is sent daily by wireless from Washington. This service was started in April of this year, but the practicability is now being considered of putting it, together with bulletins of general news,

through by means of the wireless telephone, so that the farmer, or other business man, more or less isolated, who could not profit by the dot and dash method, may be able to listen to the

ALREADY IN USE.

The Radiophone is being used by several heads of fire and police departments with marked success. In at least two recent instances the use of this device has resulted in the capture of criminals. A story is told of a fire department chief who used his Radiophone to summon additional apparatus when the local telephone service was interrupted, the fire being in the outskirts of the city and too far away from the call box to admit using that system.

spoken message to his advantage

The plan proposed is to utilize the major radio stations of the air mail service, each about 400 miles apart, and stretched across the United States, as points from which to disseminate this news by wire-

less telephone. Each station will serve approximately 125,000 square miles of territory. Wireless telephone stations are maintained in homes and places of business at approximately the small outlay of \$35 for the receiving set. There are no wires to bother with as a very simple antenna may be made from a single strand of wire stretched from the top of the house to another nearby building. Amplifiers may be used so that large audiences, if desirable, can hear what is spoken. Several banks, farm houses and county agents have signified a desire to install receiving wireless telephones and from these stations information may be relayed over cooperative farm land wire telephones.

The plan as given is to send a certain class of information at a certain hour in order that those wishing it may be advised of the hour to expect it.

The British government is already considering the appointing of a commission composed of representatives of all of her colonies to consider the practical means available for the development of imperial communication by land, sea, air, radio telegraphy and radio telephony.

Some experiments with wireless telephone apparatus have recently been made between Sainte Assise (near Melu) and Beauvais, France. Transmission and receiving were effected by means of valve sets manufactured by the Societe Francaise Radio-electrique using a transmitting energy of not more than five watts. The distance between the two stations is 74 miles, but no difficulty was experienced throughout the entire test.

Introducing a Small REAL One and a Real SMALL One

MARTIN "SCOOTAMOBILE."

Charles J. Glidden of Glidden Tour fame, has reentered commercial life as president of the Martin Motor Co. of Springfield, Mass., a company recently organized to manufacture a small car de-



The Martin "Scootamobile," Made in Springfield, Mass., a Car Constructed Almost Entirely of Aluminum and Duralumin.

signed by Charles H. Martin of the Martin Rocking Fifth Wheel Co., well known in the automotive industry.

In speaking of the Martin Motor Co. and the little car, Mr. Glidden says: "This car, which we have named the Martin for its designer, is very different from anything at present on the market. It is

made almost entirely of aluminum and duralumin, and weighs little more than 200 pounds. It will carry two people as comfortably as a heavy, expensive car, is geared to a speed equal to that of the average touring car and goes 75 miles on a gallon of gasoline.

"The Martin is the ideal car for a man to run between his home and his office. It may be parked in a hall way, or partly on the curb and partly in the street, thus occupying only a small part of the street. It can be garaged in a hall way or on the roof of an apartment building.

Another feature is that it can be curtained in, so that the passengers are as well protected from all weather conditions as in a limousine. Its many uses are so apparent as not to need enumerating. Golfers and other out-door sportsmen, salesmen, doctors, shoppers—in fact anyone who wants to get quickly and easily from one place to another—will find the Martin especially adapted to his needs.

"The Martin will probably be the highest priced car for its weight in the country, since the materials of which it is made cost from 90 cents to \$2 a pound before they are machined. The price of the finished car will be about \$500.

"We are making arrangements for the production of 50 machines a day, and plan to be ready to take orders by the time of the New York Automobile show, at which we shall show several cars.

SEEFELDER "SPECIAL."

This miniature automobile, which is complete in every detail is 11½ inches long, 5¼ inches high and 5¼ inches wide. The little motor propels it at a pace slow enough to guarantee against accidents, but it is not a self-starter. J. A. Seefelder of Los Angeles is the designer. Mr. Seefelder says that his little model has saved him the trouble of experimenting on paper. Practically every part is interchangeable, from the tires to the hood.



The Smallest Automobile in the World That Runs and Its Builder—This Machine Is Complete in Every Detail.

Desert Transformed into Garden by Modern Methods

More Than Half a Million of Fertile Acres Opened to Cultivation in Imperial Valley by Construction of Concrete Highways Below Sea Level.

(By J. L. TRAVERS, Secretary, Imperial County Highway Commission, El Centro, Cal.)

TWENTY years ago Imperial Valley was an almost uninhabited desert in the ancient bed of the Gulf of California. Today it serves as the garden of a dozen states. Its vegetables, long staple cotton, alfalfa and dairy products are famous throughout the country, and its grape fruit and cantaloupes are shipped East by the hundreds of car loads. Such products mean intensive farming, rapid growth in population, and heavy traffic to the shipping points. Imperial county is adding to her other splendid achievements the construction of a system of paved roads, and in 1920 awarded a contract for over 30 miles of concrete, which will improve several important links in her highway system. After the various centers are connected by county and state paved roads, doubtless the more important side roads will be hard-surfaced.

WORK is now under way on the 1920 contract, two mixers being operated along with other modern equipment.

An account of the remarkable transformation brought about by irrigation must start in 1893, when the first reconnaissance surveys were made by C. R. Rockwood, afterward chief engineer of the district. Despite continued difficulties in securing financial support, Mr. Rockwood persevered until in 1901 the first small stream of water diverted from the yellow flood of the Colorado near the Mexican border at last reached the settlement of Imperial. In that year a party of 24 from San Diego came over the steep mountain trail in six-horse tallyhos to witness water actually flowing through the canals. Their interest can be measured by the time spent en route each way—three days. At present a state highway, which is concrete much of the distance and eventually will be paved for its entire length, leads from San Diego to El Centro, and the 125-mile trip can be made in from four to five hours.

The barrenness of the land before water was brought in can be visualized when it is known that the annual rain fall is between one and two inches. But water was all that was lacking, for the growing

large amount of sediment which irrigation deposits upon the fields, thus adding to their fertility. Nine cuttings of alfalfa are customary. Cantaloupes may follow head lettuce and be off the ground by



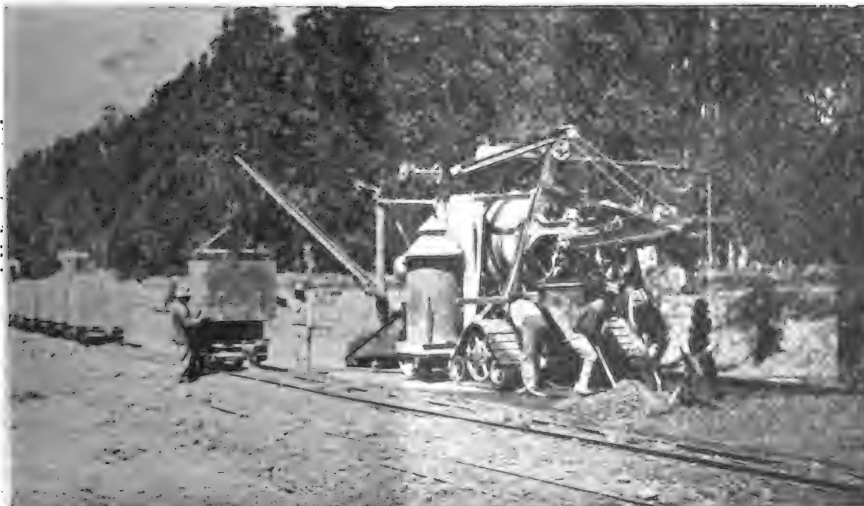
General View of Aggregate Proportioning Plant, El Centro-Calexico Concrete Road Work, Imperial County, Cal.—This Modern Adjunct to Successful Highway Building Has Transformed a Desert Into a Garden.

season is practically the entire year and the soil is of wonderful fertility, being silt hundreds of feet deep, brought down by the Colorado river when it discharged into the sea then covering the district. At all times the Colorado river carries a

July or August. Surrounded by mountains, and depressed below sea level from two feet at Calexico to 187 feet at Calipatria, Imperial Valley brings fruits and vegetables to maturity so early that they reach market ahead of produce from other centers.

Earth roads soon become nothing but dust, as the silt, fine as flour, is churned up by traffic, and were it not for the unique system of maintenance employed, these roads would soon be practically impassable. The roads were laid out very wide, and ridges have been thrown up along the center and fences so that one side can be flooded with water from irrigation ditches while the other is being used. After irrigation the water is allowed to evaporate, and the road is thoroughly dragged, allowed to bake hard and thrown open to traffic. But at best these roads soon become rough and dusty, so that the completion of the concrete is an event much desired. The present construction is being financed by part of the proceeds of a county bond issue of \$1,500,000 which was voted in 1919.

At Heber, six miles from El Centro, the contractor has located his materials yard for the construction of the El Cen-



One of the Two Smith Mixers on the Imperial County, Cal., Concrete Road System—Efficient Time and Labor-Saving Machinery Has Done Much to Make Possible the Building of This Highway.

tro-Calexico road, which is the first link to be built. It is nearly 10 miles long. Other sections covered by the present contract are the Brawley-Calipatria and the Imperial-Holtville roads. When the

crete and sprinkling the sub-grade is taken from irrigation canals. Because the Colorado river carries so much silt in suspension, a settling basin has been provided at each pump. These basins are



On the Unpaved Roads of Imperial County It Was Necessary to Flood One Side at a Time.

state has completed the paving now contemplated, practically all the towns of the valley will be joined by concrete roads, and we will have paved roads to San Diego, Yuma and Los Angeles.

Both fine and coarse aggregates are delivered f. o. b. the railroad point nearest the work by the county from pits and quarries operated by its own forces. These materials are secured outside of the valley proper, as throughout its entire length and breadth there is not one stone which has not been shipped in. Aggregates are handled by a Byers auto crane from the cars to overhead loading bins from which they flow by gravity into batch boxes on industrial cars, which are spotted below. Flat steel gates operated by wooden levers pivoted on lengths of gas pipe control the discharge from the bins. Both mixers are operated from this loading plant.

Trains of 12 to 16 Koppel cars, each carrying materials for two three-sack batches of 1:2:4 concrete, are hauled to mixer No. 1 by six-ton Plymouth gasoline locomotives. For a time, mixer No. 2 was supplied with materials by trucks which either hauled proportioned batches or dumped materials on the sub-grade, but it was planned to use industrial haul on most of the work. The two mixers are 14E, T. L. Smith machines, equipped with boom and bucket and a batch transfer whereby the box is lifted from the car truck as the skip descends. The average output for an eight-hour day has been about 500 lineal feet of 16-foot slab for each machine.

Water for mixing and curing the con-

crete about 35 feet wide by 150 feet long. Water enters at one end from the canal and is pumped out the other end by a four by six-inch Worthington triplex plunger pump driven by a 10-horsepower Fairbanks-Morse, type Z, gasoline engine. The maximum length of pipe line has been three miles, through which sufficient water has been delivered at the mixer under about 50 pounds pressure by a head at the pump of 170 pounds. The pipe was formerly used as a gas main, and is two inches in inside diameter. For wetting the sub-grade before fine grading is done, a portable pump unit is used to take water from the nearest canal. Because of the lack of rain and the character of

months. As soon as the concrete has been finished by the Lakewood tamping machine and has begun to harden, it is wet by a mist from atomizing sprays. These special nozzles are fastened three to four feet apart in a section of pipe about 50 feet long that is placed near the edge of the slab. Wet burlap is placed over the concrete as it hardens and earth dykes for ponding are prepared as soon as the concrete is strong enough. The pavement is kept under water for 10 days.

Peterson, Dillon & Patterson of Heber, Cal., is the contractor for the 30 miles now under contract, and the work is being executed under the supervision of the Imperial County Highway commission, which is composed of L. F. Shaw of Holtville as chairman, W. J. Best of Calexico and the writer as secretary.

For one unacquainted with Imperial Valley, it is hard to realize the transformation that has come about. Approximately 585,000 acres are included in the watered area of the Imperial irrigation district, and the county now has a population of over 43,000 instead of the handful of desert dwellers of 20 years ago. The great strides forward can be well illustrated by a few figures. During February and March 35 car loads of head lettuce were shipped out daily from the valley. At the town of Brawley alone 300 car loads of cantaloupes have been loaded in a single day at the height of the season, and during the summer 9000 car

This Worthington Triplex Pump and Settling Basin Supply Ample Water for Concrete Paving Operations.



soil, after rough grading has been done, the sub-grade must be compacted by pounding before it can be shaped for the concrete.

Proper curing of the slab is of unusual importance, because of the high temperatures reached during the summer

loads leave the valley. In 1920 5,648,099 pounds of butter were shipped from the many creameries. Since all these products must first be moved over the highways, one can understand why Imperial Valley must go forward with paving with all speed possible.

ADVICE TO MOTORISTS.

It is stated on good authority that a large percentage of all motorists make a practise of throwing out the clutch when coasting down a hill. The reason assigned for this is that "it saves the engine, clutch and transmission." In this they are in error, for such practise is not only dangerous, but is detrimental to those very parts which the motorist would save.

In some states a driver caught coasting down hill with his clutch released is severely dealt with. Over in France, during the war, a driver caught doing this was given a term in the guard house. This heroic treatment seemed to prove effective, it was reported.

Naturally, when approaching a decline, the vehicle is slowed up so that the engine is turning over very slowly. On releasing the clutch the car is no longer held back by the compression of the engine and naturally gains speed at every revolution of the wheels. Very often, if the hill is long, the speed attained alarms the driver, who then applies the brakes. A brake which under ordinary conditions would be sufficient to stand the car on end, or throw the driver through the windshield, will fail to hold when jammed on at high speed on a down grade. It often happens that if the road is rough the wheels will lock and skid around, perhaps throwing the car over the bank.

There is no better brake for mountain or other grades than the engine.

WOMEN AND BATTERIES.

Very few women have a natural bent for mechanics, but when it comes to taking care of a storage battery they average up a great deal better than the men.

It is easy to make a woman understand that a battery has to be taken care of, and after this point is made clear, she usually takes particular pains to follow directions and do regularly the few simple things that are necessary to keep the battery in A-1 shape.

Perhaps it is because women are used to caring for plants that they do so well in caring for batteries, but whatever the cause may be, the result is a longer-lived, more useful battery.

Automobile Prices Are Still Dropping

Following List Gives Principal Changes in Well-Known Lines Since July 1 When Fluctuations Were Shown in the Automobile Journal

| Make and Model | Old Price | New Price | De-crease | Make and Model | Old Price | New Price | De-crease |
|------------------------------------|-----------|-----------|-----------|--|-----------|-----------|-----------|
| Allen Touring | \$1395 | \$1195 | \$200 | Noma, 4-pass. | 3200 | 2850 | 350 |
| Allen Special Touring | 1695 | 1495 | 200 | Noma, 6-pass. | 3500 | 3200 | 300 |
| Allen Sedan | 2195 | 1845 | 350 | Noma, Sedan | 4350 | 3700 | 650 |
| Anderson Touring 5-pass. | 1795 | 1650 | 145 | Oakland Sedan | 1815 | 1725 | 90 |
| Anderson Touring, 7-pas. | 1845 | 1795 | 50 | Oldsmobile 43-A Touring | 1345 | 1145 | 200 |
| Anderson Sedan, 5-pass. | 2795 | 2550 | 245 | Oldsmobile 43A Roadster | 1325 | 1145 | 180 |
| Anderson Sedan, 4-pass. | 2795 | 2450 | 345 | Oldsmobile 43-A Coupe | 1895 | 1645 | 250 |
| Anderson Sport Tour. 4-pass. | 1845 | 1750 | 95 | Oldsmobile 43-A Sedan | 2100 | 1845 | 255 |
| Anderson Sport Spec. 4-pass. | new | 1850 | ... | Oldsmobile 47 Touring | 1725 | 1625 | 100 |
| Apperson 8-21 Touring | 3500 | 3250 | 250 | Oldsmobile 47 Coupe | 2225 | 2185 | 40 |
| Apperson Anniversary Touring | 4250 | 3750 | 500 | Oldsmobile 47 Sedan | 2425 | 2425 | ... |
| Briscoe Touring | 1285 | 1085 | 200 | Oldsmobile 46 Touring | 1875 | 1735 | 140 |
| Briscoe Sedan | 1885 | 1685 | 200 | Oldsmobile 46 Pacemaker | 1825 | 1735 | 90 |
| Buick Four Touring | new | 975 | ... | Oldsmobile 46 Sedan | 2775 | 2625 | 150 |
| Buick Four Sedan | new | 1650 | ... | Overland Touring | 695 | 595 | 100 |
| Case Touring | 2650 | 2250 | 400 | Overland Sedan | 1275 | 895 | 380 |
| Case Sedan | 3750 | 3285 | 465 | Packard 6 Sedan | 4250 | 3975 | 275 |
| Champion Touring | 1250 | 1095 | 155 | Packard 12 Touring | 6000 | 4850 | 1150 |
| Champion Special Touring | 1595 | 1395 | 200 | Packard 12 Sedan | 8450 | 6800 | 1650 |
| Chevrolet 490 Touring | 625 | 525 | 100 | Peerless Touring | 2990 | 2880 | 110 |
| Chevrolet 490 Roadster | 625 | 525 | 100 | Peerless Sedan | 3950 | 3790 | 160 |
| Chevrolet Coupe | 975 | 875 | 100 | Piedmont 4-30 Touring | 1270 | 970 | 300 |
| Chevrolet 490 Sedan | 975 | 875 | 100 | Piedmont 6-40 Touring | 1495 | 1285 | 210 |
| Chevrolet FD Touring | 1185 | 975 | 210 | Pierce-Arrow Touring | 7500 | 6500 | 1000 |
| Chevrolet FD Sedan | 1885 | 1575 | 310 | Pierce-Arrow Sedan | 9000 | 8500 | 500 |
| Cole Touring | 3250 | 2795 | 455 | Premier Touring | 4600 | 3890 | 710 |
| Cole Sedan | 4450 | 3995 | 455 | Premier Sedan | 6100 | 5190 | 910 |
| Columbia De Luxe Tour. 5-pass. | 1795 | 1495 | 300 | Reo Series A Touring | 1850 | 1650 | 200 |
| Columbia De Luxe Sport 4-pass. | 1795 | 1495 | 300 | Reo Series A Sedan | 2750 | 2350 | 400 |
| Columbia De Luxe Roadster 2-pass. | 1795 | 1475 | 320 | Roamer (with Continental Engine), Touring, 4-pass. | 2985 | 2485 | 500 |
| Columbia De Luxe Coupe 4-pass. | ... | 2295 | ... | Roamer Sport, 4-pass. | 3150 | 2650 | 500 |
| Columbia De Luxe Sedan 5-pass. | 2595 | 2350 | 245 | Roamer Roadster, 2 and 4-pass. | 3150 | 2750 | 400 |
| Columbia Challenger, Tour. 5-pass. | 1495 | 1195 | 300 | Roamer Touring, 7-pass. | 3250 | 2750 | 500 |
| Columbia Challenger Coupe, 4-pass. | 2295 | 1995 | 300 | Roamer Cabriolet, 3-pass. | 3850 | 3650 | 200 |
| Columbia Challenger Sedan, 5-pass. | 2295 | 1995 | 300 | Roamer Coupe, 2-pass. | 3985 | 3850 | 135 |
| Durant 4 Touring | new | 890 | ... | Roamer Sedan, 5-pass. | 4100 | 3950 | 150 |
| Durant 4 Sedan | new | 1365 | ... | Roamer Suburban Sedan, 7-pas. | 4500 | 4250 | 250 |
| Elcar 4 Touring | 1300 | 1195 | 105 | Roamer (with Duesenberg Engine), Touring, 4-pass. | 3985 | 3650 | 335 |
| Elcar 6 Touring | 1700 | 1595 | 105 | Roamer Sport, 4-pass. | 4150 | 3785 | 365 |
| Elcar 6 Sedan | 2600 | 2495 | 105 | Roamer Roadster, 2-pass. | 4150 | 3850 | 300 |
| Essex Touring | 1445 | 1375 | 70 | Roamer Speedster, 2-pass. | 4250 | 3985 | 265 |
| Essex Sedan | 2300 | 2230 | 70 | Sayers Touring | 2195 | 1945 | 250 |
| Ferris Touring | 3350 | 2595 | 755 | Sayers Sedan | 3295 | 2995 | 300 |
| Ferris Sedan | 4100 | 3695 | 405 | Scripps-Booth F-43 Touring | new | 1490 | ... |
| Ford Regular Chassis | 345 | 295 | 50 | Scripps-Booth F-43 Sedan | new | 2375 | ... |
| Ford Runabout | 370 | 325 | 45 | Stevens Touring | 2400 | 1985 | 415 |
| Ford Touring | 415 | 355 | 60 | Stevens Sedan | 3400 | 3100 | 300 |
| Ford Truck Chassis | 495 | 445 | 50 | Stevens-Duryea Family Touring | 8000 | 6800 | 1200 |
| Ford Coupe | 595 | 495 | 100 | Stevens-Duryea, 4-pass., Touring (Sport) | ... | 6900 | ... |
| Ford Sedan | 760 | 660 | 100 | Stevens-Duryea Roadster | ... | 7250 | ... |
| Franklin Touring | 2650 | 2350 | 300 | Stevens-Duryea Vestibule Limousine | ... | 8600 | ... |
| Franklin Roadster | 2550 | 2300 | 250 | Stevens-Duryea Sedan, 5-pass. | 9500 | 9000 | 500 |
| Franklin Sedan | 3650 | 3350 | 300 | Stevens-Duryea Three-Quarter Limousine | ... | 9500 | ... |
| Franklin Brougham | 3550 | 3250 | 300 | Stevens-Duryea Coupe | ... | 9500 | ... |
| Hanson Six Touring, 5-pass. | 2365 | 1795 | 570 | Stevens-Duryea Cabriolet | ... | 9500 | ... |
| Hanson Six Touring, 7-pass. | 2465 | 1895 | 570 | Stevens-Duryea Chassis | ... | 5600 | ... |
| Hanson Six Roadster, 2-pass. | 2365 | 1795 | 570 | Studebaker Light 6 Chassis | ... | 975 | ... |
| Hanson Six Sport, 5-pass. | 2465 | 1895 | 570 | Studebaker Light 6 Roadster, 2-pass. | 1300 | 1125 | 175 |
| Hanson Six Coupe, 4-pass. | 3465 | 2775 | 690 | Studebaker Light 6 Touring | 1335 | 1150 | 185 |
| Hanson Six Sedan, 5-pass. | 3565 | 2885 | 680 | Studebaker Light 6 Coupe Roadster | 1695 | 1550 | 145 |
| Haynes 55 Touring | new | 1785 | ... | Studebaker Light 6 Sedan | 1995 | 1850 | 145 |
| Haynes 55 Sedan | new | 2835 | ... | Stutz Touring | 4000 | 3350 | 650 |
| Haynes 75 Touring | new | 2485 | ... | Templar Touring | 2385 | 1985 | 400 |
| Haynes 75 Sedan | new | 3485 | ... | Templar Sedan | 3185 | 2785 | 400 |
| H. C. S. Touring | 2975 | 2775 | 200 | Velie 48 Touring | 1885 | 1585 | 300 |
| Holmes Touring | 3350 | 2950 | 400 | Velie 48 Sedan | 2885 | 2485 | 400 |
| Holmes Sedan | 4550 | 4150 | 400 | Velie 34 Touring | 1485 | 1385 | 100 |
| Hudson Touring | 2250 | 1895 | 355 | Velie 34 Sedan | 2485 | 2085 | 400 |
| King Touring | 2725 | 2225 | 500 | Westcott Lighter 6 Touring | 2290 | 1890 | 400 |
| King Sedan | 4035 | 3235 | 800 | Westcott Lighter 6 Roadster | 2290 | 1890 | 400 |
| Kissel Standard Touring | 2775 | 2475 | 300 | Westcott Lighter 6 Coupe | 3390 | 2890 | 400 |
| Kissel De Luxe Touring | 3475 | 2975 | 500 | Westcott Lighter 6 Sedan | 3390 | 2890 | 400 |
| Kissel De Luxe Sedan | 4275 | 3775 | 500 | Westcott Lighter 6 Sport | 2390 | 1990 | 400 |
| Kline Touring | 2290 | 2090 | 200 | Westcott Larger 6, Touring | 2990 | 2090 | 900 |
| Liberty Touring | 1860 | 1595 | 265 | Westcott Larger 6, Sedan | 4590 | 3490 | 1100 |
| Liberty Sedan | 2900 | 2495 | 405 | Westcott Larger 6, Limousine-Sedan | 4690 | 3690 | 1000 |
| Mercer, All Open Models | 4500 | 3950 | 550 | Wills-St. Claire, Touring, 5-pass. | 3200 | 2875 | 325 |
| Mercer Limousine | 6200 | 5650 | 550 | Wills-St. Claire, Roadster, 4-pass. | ... | 2875 | ... |
| Mercer Coupe | 5700 | 5150 | 550 | Wills-St. Claire Coupe, 4-pass. | ... | 3750 | ... |
| Moon 6-48, Open Models | 1985 | 1785 | 200 | Wills-St. Claire, Sedan, 7-pass. | 4700 | 4100 | 600 |
| Moon 6-48, Enclosed Models | 2985 | 2785 | 200 | Willys-Knight, Touring | 1895 | 1525 | 370 |
| Nash 6 Touring | 1695 | 1545 | 150 | Willys-Knight, Sedan | 2750 | 2395 | 355 |
| Nash 6 Sedan | 2895 | 2695 | 200 | | | | |
| Nash 4 Touring | 1395 | 1195 | 200 | | | | |
| Nash 4 Sedan | 2185 | 1935 | 250 | | | | |
| National Touring | 3750 | 2990 | 760 | | | | |
| National Sedan | 4950 | 3990 | 960 | | | | |
| Noma, 2-pass. | 3000 | 2800 | 200 | | | | |

Note: Touring car prices are for five-passenger models where one is built, otherwise seven-passenger.



A TRIBUTE

ELWOOD HAYNES, inventor of the first automobile and father of an industry that in less than 30 years has attained third place in the census of America's trade achievements will soon celebrate his 64th birthday.

Though still in the prime of life, using the word in a purely descriptive rather than a literal sense, Mr. Haynes has been privileged to play a dual role in the pageant of America; a privilege that falls to few men—since he has given to the world a wonderful invention—and he has also served humanity.

Further eulogy would be redundant.

BIOGRAPHY

- 1857—Oct. 14, born Portland, Ind.
- 1872—Invented apparatus for making oxygen. Succeeded in melting brass, cast iron and high carbon steel, using furnace and blower of his own construction.
- 1878—Entered Worcester Polytechnic Institute, Worcester, Mass.
- 1881—Graduated from Worcester; thesis, "The Effect of Tungsten on Iron and Steel." Discovered tungsten chrome steel.
- 1883-1884—Principal of Portland (Ind.) high school.
- 1884—Entered Johns Hopkins University, Baltimore, Md., and took post-graduate course in chemistry and biology.
- 1886-1890—Manager Portland Natural Gas & Oil Co., Portland, Ind.
- 1887—Conceived idea of a "horseless carriage."
- 1888—Invented small vapor thermostat.
- 1890—Field superintendent of Indiana Natural Gas & Oil Co., Chicago, Ill., with headquarters at Greentown, Ind.
- 1891—Prepared drawings for the construction of a "horseless carriage."
- 1892—Completed the plans for the actual construction of the machine. Moved to Kokomo, Ind.
- 1893—November 30, bought one-horsepower Sintz marine upright, two-cycle, gasoline engine.
- 1893-1894—Built the "horseless carriage" and drove it on the first trip July 4, 1894.
- 1894—Invented successful carburetor and first automobile muffler.
- 1895—Introduced use of aluminum into automobile engine construction. Won prize of \$150 from Chicago Times-Herald for best balanced engine in "horseless carriage."
- 1896—Nickel steel introduced into automobile construction.
- 1897—Alloy of chromium and nickel containing carbon and silicon discovered.
- 1898—Alloy of pure chromium and nickel formed.
- 1899—Made first 1000-mile trip in motor car in America, Kokomo to New York City.
- 1905—Rotary valve gas engine invented and built.
- 1906—Basic invention of stellite for use in table and pocket knives, etc., made of nickel or cobalt with chromium.
- 1907—Obtained basic patent on stellite.
- 1912—Improved invention of stellite to include use in high-speed metal cutting tools. Invented stainless steel, a rustless steel.

Steam Car Enthusiasts Interested in New Coats

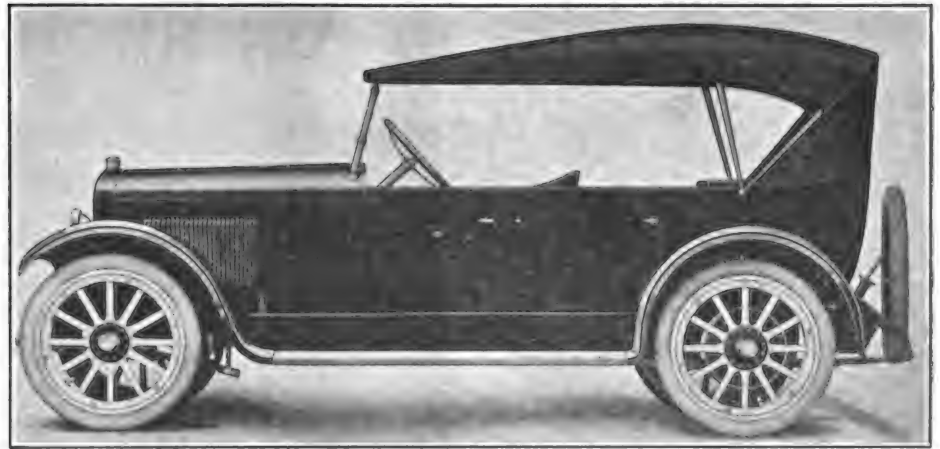
COATS STEAMERS, INC., Indianapolis, Ind., a new organization capitalized under the laws of the State of Delaware, is entering the automotive industry with a practical steam car to sell around \$1000.

The Coats Steamer in appearance is the same as any up-to-date gasoline machine. The foot brake and clutch pedal occupy the usual positions and a gear lever similar in appearance to those in use on gasoline cars is placed as it might be on a gasoline car. The dash has a switch; there are electric head lights; the rear axle is identically the same as those in ordinary use, the radiator, which happens to be a condenser, is, nevertheless, to all intents and purposes a radiator. Only under the hood is there a change.

A boiler occupies a position just behind the radiator and immediately behind that, under the driver's feet, is the engine and gear box. Only in these units is the car different.

To start the car the driver turns on a switch. The switch starts a small electric motor which drives a fan and a pump. The fan forces air through the fire box. The automatic atomizing jet at the top of the fire box opens and sprays kerosene into this fire box in quantities exactly suited to the amount of air that enters. This insures perfect combustion. The kerosene, as it enters, is sprayed past a spark plug which automatically ignites it. This makes the old and objectionable pilot light a thing of the past. The fire once started, enough steam to run on is generated almost immediately.

A throttle lever, placed just below the



Improved Design, Special Features and Change in Engine Location with Direct Drive to Rear Axle Makes Coats Car Desirable.

wheel on the steering post, controls the entire forward movement of the car. There are two speeds, forward and one reverse, but there is no clutch. The Coats Steamer starts just as readily on high as on low.

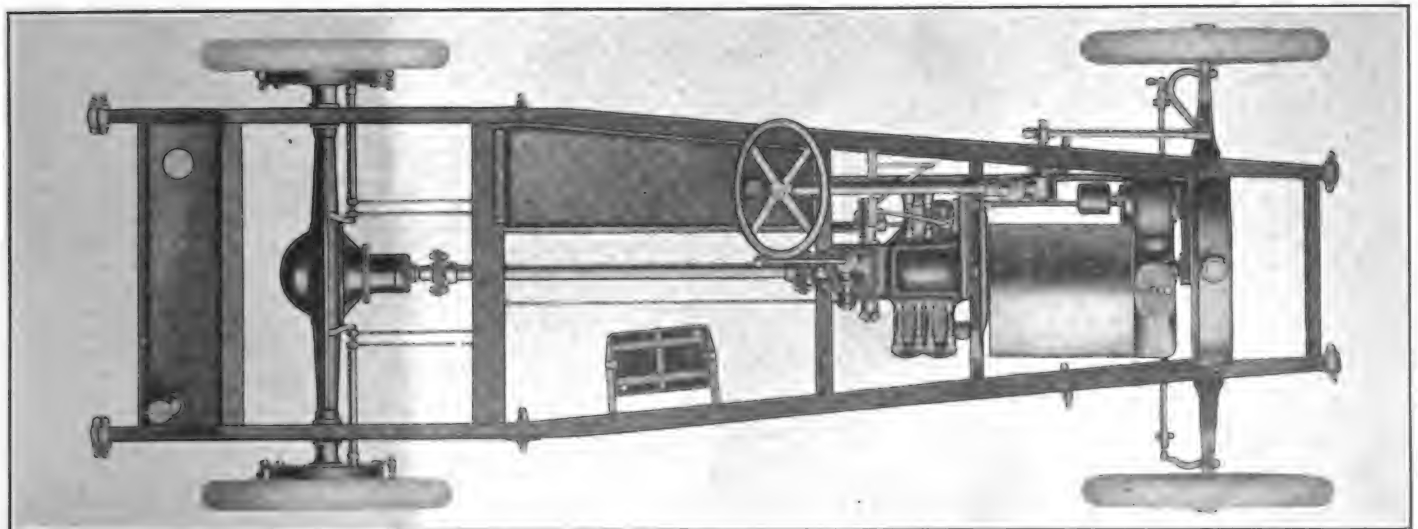
There is a clutch pedal, however. This is used only when more power or speed is needed. When this pedal is depressed it allows steam to enter the cylinders for the full length of the stroke. When the engine does not require this extra power the inlet cuts off the incoming steam when the stroke is five-eighths completed, and the expanding steam continues the pressure until the stroke is complete.

The engine is V-shaped and has three cylinders, with two on one side and one on the other. Had they been placed radially one cylinder at the bottom would have caused trouble by reducing clearance, and would have been a catch-all for water that might collect from condensation, endangering the cylinder itself, which might have been subjected to fracture because of the water being compressed by the piston. As the cylinders are placed there is no possibility of this, and the crank shaft is so swung that an impulse is given it every 120 degrees, while the impulses themselves are felt through very nearly 180 degrees, thus

over-lapping for nearly 60 degrees, and adding to the usual smoothness of the steam engine the over-lapping power that the gasoline engine designers have attempted to get in multi-cylinder motors.

The engine itself is light, small and powerful. Tested as a gasoline engine would be tested it produces over 50 horsepower and yet it swings no fly wheel and carries only about 20 moving parts. There are no spark plugs in the cylinders, no carbon to foul the oil and hurry the wear of the cylinder walls and pistons.

The inlet and exhaust valves are similar to those in use in most gasoline cars. The incoming steam enters when a poppet valve is actuated by a cam shaft, and this inlet valve closes when the piston has moved five-eighths of the way down the cylinder, except when the foot pedal is depressed, when it allows steam to enter for the entire stroke. At the bottom of the stroke a port similar to those in use in some two-cycle engines is uncovered and the steam escapes until that which remains in the cylinder is under pressure equal to that of the air. But instead of the piston working against this pressure on its return stroke, a relief valve opens and the returning piston entirely exhausts the steam. At the top of the stroke the relief valve closes and the inlet opens, repeating the cycle.



Air Plane View of Coats Steam Car Chassis Showing Location of Engine Pump and Condenser in Front of Dash, Engine and Gear Box Under Foot Boards. Water Tank at Left Side of Frame and Fuel Tank at Rear—Storage Battery for Lights and Burner Ignition at Right Side of Frame.

Troubles in Automobile Engine

Often Due to Owner's Neglect—Causes of Lack of Power May Be Traced by Simple Process of Elimination to Two or Three Probable Sources.

(By RICHARD EVANS.)

EVERY present or prospective motor car owner, driver or chauffeur can read, with benefit, the following article, which is written by an acknowledged expert on automobiles, their construction, care and repair, as he treats his subject in a simple, non-technical way. Mr. Evans, the author, has been intimately connected with the automotive industry since 1901, during which time he has personally supervised the renovation of nearly every type of automobile and truck engine made in this country. He has spent three years working at various factories in England, and was for a time connected with the engineering staff of a well-known car manufactory in Germany. At the present time he is engaged in research work.

HOW many times during the course of the year do car owners call on the garage men to restore the lost power of their engines. There is hardly a garage owner who operates a repair shop, in connection with sales, a storage and service, but has been called on by customers for this type of work, yet much of this could be done by the owner. First he must study the contingent units, defects in the operation of which may cause loss of power. Many reasons can be given for this state of affairs, chief among which may be mentioned the following, which in nine out of 10 cases, if followed through in a systematic manner, will usually eliminate the trouble. They may be summarized as follows:

Poor compression; too weak or too rich a mixture; operating in high altitudes; weak spark; ignition timed too late; running with spark retarded; valves

not timed correctly; valve tappets not adjusted properly; valves not seating properly; lack of lubrication; lack of cooling water; lack of gasoline; dragging brakes; slipping clutch; choked muffler causing back pressure.

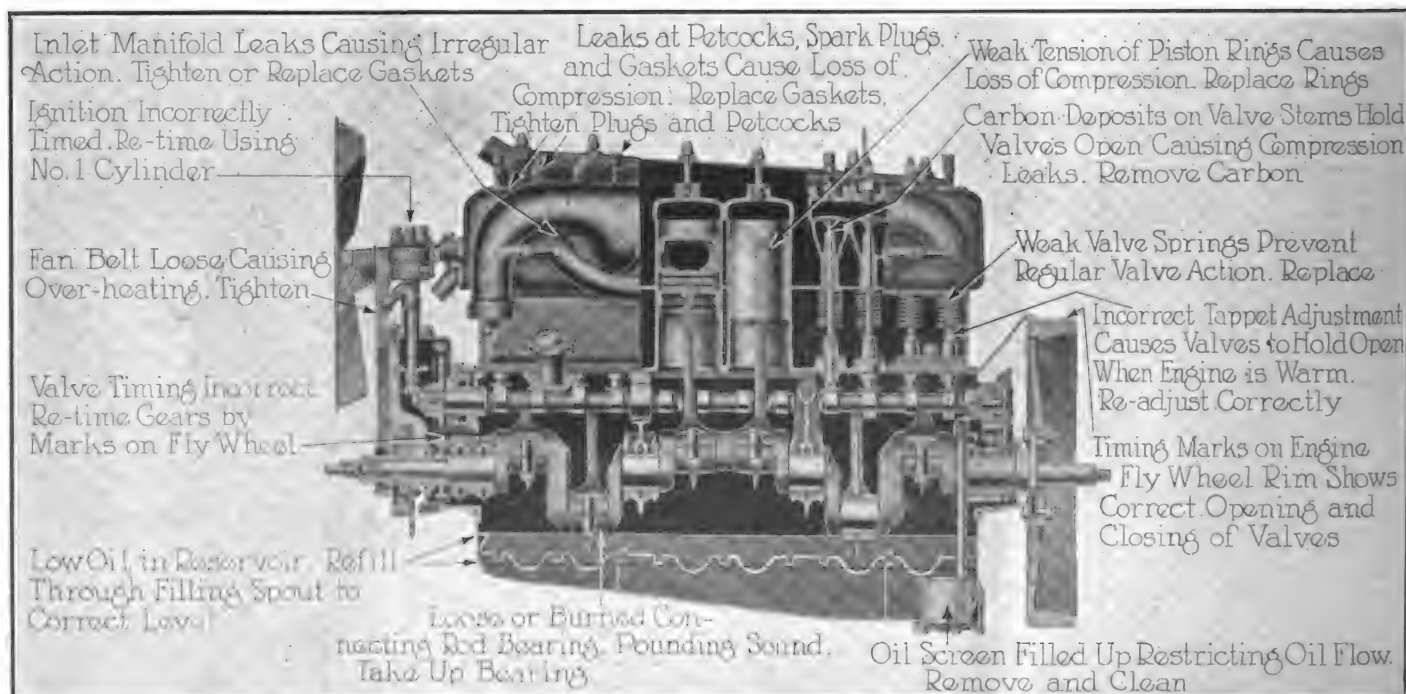
Poor Compression.

Poor compression is one of the common causes for lack of power. Unless the compression pressure is sufficiently high, the explosion will be lacking in force and the power of the engine will be weak. A simple manner by which the engine compression may be noted is by turning the engine slowly by hand, with the ignition off, throttle wide open, and the compression observed in each cylinder; or a more accurate way is to remove the spark plug and screw in a small pressure gauge, which should indicate from 60 to 80 pounds at the end of the compression stroke, depending on the make of engine. Loss of compression is commonly due to

leaky or improperly seated valves, or to leaky joints. Leaky thread joints, valve caps, or cracks in the cylinders are also all common causes of loss of compression.

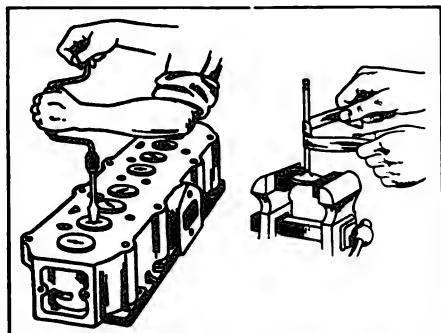
These can be detected by a hissing sound or, if the suspected leak is covered with gasoline or oil, the leak will show itself by bubbles arising through the oil. If the trouble cannot be located in this manner, attention should be given to the valves.

As a rule, the intake valve requires less attention than the exhaust, because the former comes in contact with the cool, fresh fuel charges, whereas the latter is apt to become fouled and burnt by the hot and dirty exhaust gases. A frequent source of leaky valves is carbon deposit on the valve seats. These deposits prevent the proper seating of the valves, the remedy being to clean and grind them. Still another cause is a shoulder on the upper edge of the valve face. This is



A Few of the More Important Engine Troubles Are Here Illustrated, Together with the Remedy for Each—Locating the Trouble Is Often Difficult, Especially If It Is Indicated by a Noise—Sound Is Transmitted by Metal Connections and Often Confuses the Repairer.

usually the result of frequent grinding, which makes a depression in the valve face, the lip or edge preventing the valve from seating to its full depth on the bevel, causing the valve to be held in a partially open position. Weak compression results and blackening of the seat and valve face with carbon follow.



Invert Cylinder When Grinding Valves—Remove Carbon Deposit on Valve Stem with Emery Cloth.

Grinding Valves.

Valves that are found in this condition should be refaced before regrinding to insure their seating properly. Often the seat, in which the valve positions, is pitted or ground so deep that the valve will not seat properly. Valve seats that are in this condition should be refaced with a special reseating tool which cuts a new seat corresponding to the bevel of the valve face. The valve and seat may then be reground with every assurance that the valves will fit gas tight, provided that the regrinding is properly performed.

A simple, easily arranged valve refacing tool which can be made by the home repairer consists of a small, high-speed hand drill having a chuck for the shank of the drills that will open sufficiently to allow the valve stem to be inserted. Clamp the hand drill in a vise lengthwise and place the valve in the chuck, setting the chuck up tightly. Take a large mill file about 12 to 14 inches long and drive the tang of the file lightly into the bench, slanting it slightly and turned in such a manner that it will correspond with the original bevel of the valve face. Turn the valve briskly with the handle of the drill bearing the file against the bevel face of the valve. Continue this until the edges are ground down to a level with the center and the center smoothed up. Remove the valve and grind in the valve seat. In trueing the valve seat special cutting tools are available at a small cost, which can be operated in a bit stock.

For grinding the valve there are several good mixtures on the market, prepared ready for use, or requiring the addition of light oil to form a soft paste. Compounds of this nature are composed of two grades, light and coarse, each grade being separate either in each end of the box in which they come or, when dry, in separate containers in the same box.

Method of Procedure.

First, coat the valve face lightly with the coarse grinding abrasive, place the valve in its seat and rotate with a valve grinding tool, which may be purchased or home made. Many repairers use a screw driver for this work, rotating it between

the palms of the hands. Still others prefer to use a bit brace, moving the valve a complete turn in one direction and then reversing it. The bad feature of the bit brace is that too much pressure may be applied and the abrasive prevented from cutting. A light pressure should be applied and every few moments the spring should be allowed to lift the valve from its seat, permitting the fresh abrasive to work in so that it will continue to grind. After cutting effect of the abrasive has been exhausted the valve should be removed, the old abrasive wiped from the valve face and seat and fresh abrasive supplied. Valves that have been refaced and the seats refaced do not require lengthy regrinding as a rule, and after a clearly defined ring is shown on the valve face, grinding with the coarse abrasive should stop, and the job finished with the fine abrasive. The fine abrasive smoothes down the ridges and makes a gas tight fit between the valve face and the seat. After the grinding operation is finished, the seating of the valve may be tested by applying a little Prussian blue to the valve face and rotating lightly by hand to coat the face of the seat. Remove the valve and wipe the Prussian blue from valve face and place in the guide again turning the valve lightly in its seat. High spots on the valve face will be denoted by the Prussian blue and further grinding will be necessary to remove them.

In grinding clean the parts carefully after each operation to prevent the abrasive from reaching other working parts such as the pistons or cylinders, as the abrasive, if allowed to remain on the parts, will continue to cut into the metal and will cause future damage. It is always a good plan to stuff a piece of waste in the open cylinders to prevent the abrasive from entering. Be sure to remove it again before replacing the cylinder head. Similar operations are performed when regrinding valves held in cages, only in this case the cage is removed and ground at the bench as the valve stem can be held in the vise jaws, simplifying the

work. Valve ground in L or T-head engines not having removable heads are ground through the ports above, using a valve grinding tool or screw driver. A wad of waste should be inserted between the valve seat and the opening into the top of the cylinder to prevent abrasive from working through on to the piston, and should be removed after the grinding is finished.

Valve Adjustment.

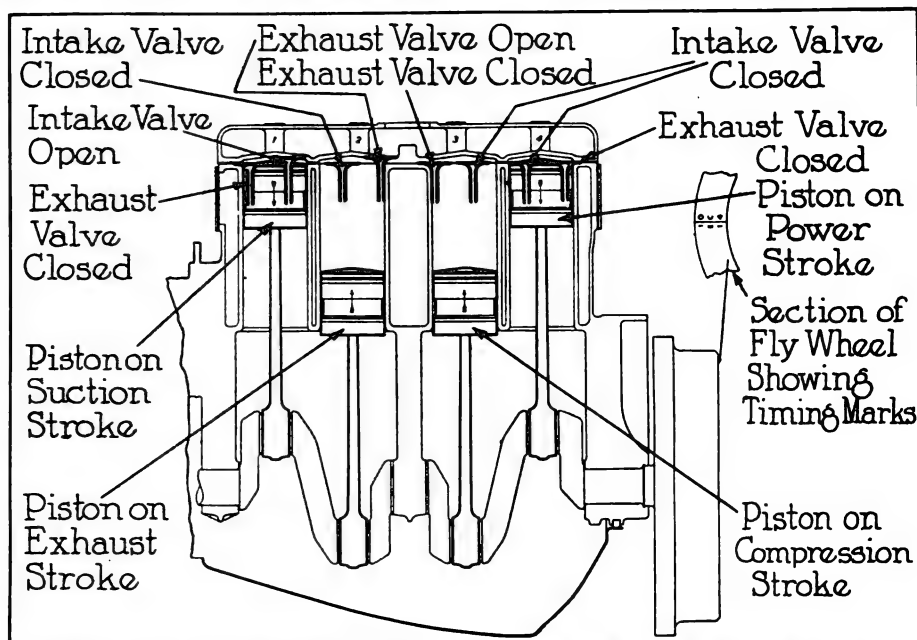
Poor adjustments of the valve-operating mechanism may often cause poor compression, even if the valve seats have been properly ground in. The valve spring may be broken or too weak to close the valve on its seat in the proper time. Sticking of the valves when opened may also cause low compression.

The clearance between the valve stem and push rod may be the cause of considerable trouble. The clearance is usually about the thickness of a thin visiting card, the exact amount being somewhat different for different cars, but in no case is it greater than 1/32 of an inch. Testing the clearance should only be attempted when the engine is warm, for if adjusted when the engine is cold the valves will hold open when the engine is warmed up, due to the expansion of the metal.

If this clearance for the intake valve is too great the lift is reduced, thus preventing the proper charge from getting into the combustion chamber of the cylinder. If the exhaust valve lift is reduced in the same manner it will be more difficult for the exhaust gases to escape. Too much clearance also changes the time of the valve opening and closing, causing them to open late and close early. If, on the other hand, this clearance is too small or entirely absent, the valves will open early and close late, or will not close on its seat.

As the valve seats are lowered by continual grinding, the clearance is gradually changed. For the proper operation of the valves, careful attention should be given to this clearance space.

A weak spring on the exhaust valve
(Continued on Page 27.)



Sectional View Showing Four-Cycle Engine, Indicating Piston and Valve Action with Relation to Valve Opening and Closing Positions Marked on Fly Wheel.

It's coming—

PERMANENT prosperity for automobile dealers firmly founded on the conditions of today, is here.

IT IS at hand for you in the form of a salable, quality car at a reasonable price, with a liberal, money-making discount.

BEHIND the car is a group of earnest men, headed by one of the leaders in the industry; a large going plant; ample finances.

NEVER before in the history of the automobile business has there been a more certain, timely chance for the dealer to make money steadily, and plenty of it, than there is now for the man who makes a connection with

- 1.—*The right car*
- 2.—*At the right price*
- 3.—*With the right discount.*



Dealers—
Wire-Write
P.O. Box C—Eliot Station
Detroit, Mich.

Number Two

(When Writing to Advertisers, Please Mention the Automobile Journal.)

HAPHAZARD days are over in the automobile business. Sane, wholesome natural laws that control and assist in other businesses are now asserting themselves in this. Permanent prosperity is based on men, markets, merchandise and methods.

A LONG established Automobile Company, thoroughly financed, with complete factory facilities, has built a car and worked out a proposition which fits into the times and is of the greatest importance to every dealer with ambition and vision.

MOTOR car merchants who wish to turn to their advantage, the changing conditions of the times in automobile selling, rather than continue to suffer from them, should act at once. By mail or wire.

Dealers—
Wire..Write
P.O.Box C - Eliot Station
Detroit, Mich.



(When Writing to Advertisers, Please Mention the Automobile Journal.)

McFarlan Is Truly Distinctive



Classic Lines Distinguish New McFarlan Twin-Valve Sport Roadster—Is a Car for the Discriminating Buyer.

THE McFarlan Motor Corporation, Connersville, Ind., in announcing its Twin Valve series of motor cars says: "The present McFarlan organization is the result of 75 years of earnest endeavor and the ambition of every unit of this organization is to produce the best that is known in the motoring world. The Twin Valve series fills every requirement of the new standards for speed, power and dependability which were established under war's exacting demands. Every line of the new Twin Valve model expresses the ideas constantly in mind of its designers, safety, dependability, power, speed, comfort and beauty. The McFarlan Twin Valve Six is the result of many years of tireless effort in producing high-powered, six-cylinder motor cars, embracing all of the proven mechanical advancements of the times, carefully excluding that type of engineering which appeals to the imagination, but lowers the standard of dependability.

THE McFarlan Twin Valve series is composed of 11 distinct bodies mounted on the one chassis, including the sport touring four-passenger, open touring seven-passenger, California touring seven-passenger, sport roadster two-passenger, touring sedan seven-passenger, suburban sedan seven-passenger, Knickerbocker cabriolet, five passengers in rear compartment, sport sedan four-passenger, limousine five-passenger, coupe three-passenger and town car carrying five passengers in the rear compartment.

Twin-Valve T-Head Type Chosen.

After long experience with both valve-in-the-head and T-head engines, the company is firmly convinced that the T-head engine offers the longest life and the greatest freedom from engine troubles; in other words, the greatest dependability of any type of engine that can be designed.

The present job is of this design and, although quite different in detail from former models, the bore of $4\frac{1}{2}$ inches and stroke of six inches has been retained. This engine is constructed with removable heads and is fitted with four valves to each cylinder, in line with the very best modern practise.

Lubrication is by the hollow crank method and force feed is carried to all bearings, including the piston pin and outboard cam shaft bearing. The poppet safety valve is installed at the front end of the oil line as far away from the pump as possible to avoid the possibility of any accidental relief of pressure before the oil reaches the farthest point to be lubricated. Pressure is furnished by the conventional type of gear pump placed at the lowest part of the sump, taking its oil through a very fine mesh screen.

The crank diameter of the main journals is $2\frac{3}{8}$ inches and the total journal area (projected) is 36.1 square inches per engine. The crank pins have a diameter of $2\frac{1}{4}$ inches and a total bearing area (projected) of 30.5 square inches per engine.

The engine has a displacement of 572.5 cubic inches. The S. A. E. rating is 48.6 horsepower at 1000 revolutions and develops 117 horsepower at 2000 revolutions.

The gear train in the front end is composed of five gears with $1\frac{1}{2}$ -inch face, all gears keyed in position. The generator and starting motor brackets are cast integral with the crank case and are so arranged that these pieces of apparatus can be readily withdrawn from the engine for examination or repair.

Ignition is furnished by two entirely separate systems. A two-point Berling high-tension magneto fires simultaneously two plugs set in the opposite sides of each cylinder, insuring the most perfect explosion and the utmost efficiency from the gasoline. As an auxiliary system and for easy starting in cold weather, a Westinghouse battery system is fitted, firing a separate set of plugs over the intake.

The cam shafts are drop forgings with cams forged integral. Each cam shaft has four bearings with a diameter of two inches and a total area (projected) of 20.6 square inches.

The pistons are of special cast iron construction and weigh exactly three pounds each. The cam shaft bearings are of bronze throughout the engine and are of one-piece type. All main journals and connecting rod bearings at the lower end are of bronze babbitt lined.

This car has been very enthusiastically received by motorists.

SPECIFICATIONS TWIN VALVE SIX.

Engine—McFarlan Twin Valve Six, Cast Three En Bloc.

Bore and Stroke— $4\frac{1}{2}$ by Six Inches.

Horsepower—S. A. E., 48.6; Actual, 120.

Ignition—Two Separate Systems. First, Double Magneto Firing from Opposite Sides of Combustion Chamber; Second, Battery Ignition Firing from Intake Side.

Carburetor—Rayfield, Fed by Vacuum, Main Tank at Rear Fitted with Quantity Gauge; Capacity, 26 Gallons of Gasoline.

Lubrication—Pressure Feed to All Bearings Through Hollow Crank Shaft; Capacity, Nine Quarts.

Cooling System—Honeycomb Radiator. Centrifugal Shaft-Driven Pump with Bronze Impeller.

Clutch—Multiple Dry-Disc Adjustable Type.

Transmission—Three Speeds and Reverse, Selective; Aluminum Case; Shafts Mounted on Adjustable Timken Roller Bearings; Power Take-Off Drives Tire Pump.

Rear Axle—Full Floating Type Fitted with Spiral Bevel Driving Gears and Timken Tapered Roller Bearings.

Front Axle—Drop Forged, One-Piece I-Beam Type; Knuckles and Wheels Mounted on Timken Roller Bearings.

Steering Wheel—Worm and Gear Type, Left Hand Drive, Center Control.

Chassis Frame—Pressed, of Medium Carbon Steel, Equipped with Sub-Frame for Motor and Transmission; Depth, Eight Inches.

Springs—Front, Semi-Elliptic; Rear, McFarlan Cradle Type.

Wheelbase—140 Inches, Turning Easily in Average Street; Tread, 56 Inches.

Chassis Lubrication—Pressure Cups on All Friction Points.

Final Gear Ratio— $3\frac{1}{2}$ to One.

Wheels—Wood, Disc or Wire.

Tire Dimensions—Touring, 35 by Five-Inch; Sport Models, 33 by Five-Inch Cords of Standard Make.

Brakes—Service, External Contracting; Emergency, Internal Expanding.

Rims—Especially Designed for Type of Wheel Used.

Starting and Lighting—Westinghouse Two-Unit System; Starting Button Centralized Under Steering Wheel.

(Westinghouse Air Springs at Extra Cost.)

Nation's Second Line of Transportation

Clarence A. Earl, Well Known Automobile Manufacturer,
Gives Interesting Interview—Shows Important Work Done
by Passenger Car—Emphasizes Need for Better Highways.

(By D. M. SHAW.)

THIS county's transportation facilities can never completely fail to a point where the movement of the necessities of life will be stopped. In the automobile this nation has a permanently efficient and over-ready second line of transportation capable of vast capacity as to passengers, larger perhaps than that actually available in the railroads. In the matter of short hauls of freight the motor truck is proved to a point where the railroads are seriously considering them as competition.

What a wonderful thing it is for this country, with its vast and diversified production, its activities reaching from coast to coast, to be as secure in the distribution of this volume of merchandise as the automobile and motor truck make us.

Good roads are necessary to maintain this second line of transportation and this year it is evident that the amount of new good road mileage will exceed the building of any previous year. The national government has been actively encouraging the continued systematic construction of good roads, aiding the various states financially by granting a subsidy and in turning over to the various states much of the surplus equipment of the army.

In the early days of good roads propaganda the farmers in the big western states were slow to enthuse over it. They had not taken up the automobile then, of course, as they subsequently did, and the added taxes that came when new concrete roads were built meant a good deal to the farmer. He figured that the roads were good enough for his father and himself to always get into town if they had the right kind of teams and that, anyway, the city folks touring out in the country and running over chickens and unwary ducks were to be the principal beneficiaries of the proposed improvements.

However, the advance of the automobile went steadily on into the farming communities. The ease with which the farmer could run into town and back again, and then over to a neighbor's to borrow a tool or take one back, and then on again to do countless other errands, quickly sold the automobile to him. Its advantages to him must first be obvious, and with those properly presented the automobile came into its own in every farming community of the country.

Now that the farmer had an automobile, the program for new and better roads was viewed differently. He was favorable to it. He saw what it meant to him. What if the city folks who did not pay taxes in that country did benefit? So

did he, and he would benefit in the neighboring counties, where the farmers there had to stand the burden.

The present-day successful automobile-owning farmer looks back now and laughs at his early antagonism to good roads. The benefits he has derived since their construction are so many that it would be impossible to sit down and enumerate them.

Winning Farmer Over Gave Impetus to Good Roads.

Winning the farmer over to the side of the good roads propaganda gave road building an immediate impetus. The speed with which trips with cars and trucks could be made from nearby cities to his farm put the farmer, who previous-



Clarence A. Earl, Head of Earl Motors, Inc.

ly had considered his place a little out of the way, in quick and constant contact with things in town. The automobile and good roads gave a new and pleasing side to the home life on the farm, for the farm mother and her children could now go in and see a motion picture show and get back to the farm long before the ordinary bed time—and that is early enough on a farm. There was not the usual unhitching of horses, watering and bedding down, and running the buggy into the shed, and locking up the barn, and other things that develop for attention once the farmer gets looking around.

The car was driven under the shed or into the garage and the lights turned out. Community life began to develop by leaps and bounds. Neighbors who had known each other for years but visited infrequently, and then in town or at church, were reunited. The automobile made a run over to the next town an easy matter and the farm women found in the automobile the most powerful and constructive force for building neighborhood

spirit and community sociability offered to them thus far.

They naturally felt enthused, so they took up the gospel of good roads and blended their efforts with the so-called city folks. Now every one is for good roads because their obvious advantages are plainly manifold. They mean, for the city people, getting out into the big open country, and the city children now have a chance to see a cow and really know what the animal is and what it is for and how it lives and where. The city man can make a fast run out to a neighboring lake and get out his fishing tackle before the fish know he is even on the way. Back to town with a nice mess of fish—and all because of the automobile and good roads. Touring, long drives over extended periods of time, from weeks to months, has now become a big factor in our national idea of recreation.

Where a man was accustomed in former days to take his family to a quiet spot and spend his vacation, he can now take them on a tour and see 10 times as much of the natural beauties of the country as previously, and at about one-tenth of the cost. And to the business man, the salesman making small country towns, the automobile has increased his efficiency to such an extent that every enterprise doing any amount of business in rural communities—and others, for that matter—has equipped its salesmen with automobiles. They can cover more territory and do more business at less cost than in previous years. They are enabled to call upon more customers more often, thus adding to their sales records and maintaining a frequent contact with the trade, which after all, is the secret of good selling.

Learn How Other Half Lives.

As the city man drives out into the country to see that which is not available to him in the city, so does the farmer drive into the city to view its hustle and greatness. Thus each comes into the zone of the other, learns the modes of living there and some of the problems. There develops a better understanding between the city and rural population, and a better appreciation of the inter-dependability that does and always will exist.

If the farmer had to buy transportation on the railroad every time he visited his nearest big city, his trips would be infrequent. But the automobile—the second line of transportation—makes him independent. All he needs is a good road to make the drive pleasant, and he is working hard for that now.

Winter's Icy Blasts Have No Terror for the Well Protected Owner of This Superb Enclosed Model.



Luxury and Comfort of Passengers Was Kept Constantly in Mind in Designing the Cole Eight.

Features of New Cole Eight

Exclusive Refinements and Improvements Include New Pistons Which May Be Interchanged If Desired—Eliminate Sideslap and Sticking and Consequent Overheating.

FEATURED in the new Cole models for late summer delivery is a new piston which the Cole Motor Car Co., Indianapolis, Ind., has adopted for use in the Lycoming eight-cylinder "V" engine, which is used in Cole cars. Constant clearance under all speeds is assured with the new improvement, and sticking or slapping of the pistons is prevented by the adoption of this new piston. Many additional points of refinement are noted in the new models which tend to follow out the policy of the company to continue the Cole as the "year-ahead" car. Cole Aero-Eighths, even though reduced in price \$700 to \$455, actually cost \$200 more to build than any previous model ever built by the organization.

EXCLUSIVE refinements and improvements which make the Cole the greatest value this company has ever produced are the result of J. J. Cole's interpretation of the present demand as something more than a mere reduction in price.

To those building for permanent success rather than temporary advantage, Mr. Cole believes a reduction in quality in keeping with the reduction in price will be fatal. The advance of the motor car towards mechanical perfection must continue.

Only a company so fortunately situated as is the Cole, with its large resources and its opportunities for manufacturing economies due to large, well-organized facilities, can meet the demand for lower prices with a car greater in quality than any previous models.

Chief of the refinements in the new Cole Aero-Eight which make it cost \$200 more to build is the constant clearance piston of aluminum with which, official tests have proved, new and unseasoned motors can be operated at maximum speeds without damage to motors.

New Piston Shows Remarkable Results.

The tests of the constant clearance piston, designed and constructed by the Cole Co. were held on the Indianapolis speedway under official A. A. A. supervision. Three new cars were used.

The tests proved that pistons can be so designed and constructed that they will

be uniform in size and interchangeable from one motor to another without the tedious process now universal in the industry of lapping in.

With the new Constant Clearance pistons there is no fitting by hand by expert mechanics. They are simply slipped into the motor, solving at one and the same time, not only one of the most troublesome service problems, but one of the most expensive as well.

The interchangeability of the new Constant Clearance piston was demonstrated at the Indianapolis speedway on the second day of the tests run there.

On the second day the motors of the three new Cole Aero-Eights used were torn down. The piston assemblies were extracted. A.A.A. Technical Representatives Chester Ricker and W. C. Buser redistributed the pistons so that no car received the same pistons it was equipped with originally.

The motors with changed piston assemblies were then reassembled. Two mechanics in one case had the motor in operation one hour and 35 minutes after they started, a tribute to the accessibility of the Cole motor. All of the motors were reassembled and in operation in less than two hours.

The cars were put through a series of acceleration tests from 10 to 50 miles and operated at maximum speeds for sustained periods. Despite the fact that no car had its original pistons, the per-

formance of the day before was duplicated in every instance and bettered in some cases.

In the high-speed tests there was no seizing or slapping of pistons and measurements taken on the third day, following the tests by A. A. A. representatives, proved that bearings and other working parts had not suffered in the slightest.

In the acceleration tests, the average of each car for six tests was taken and the grand average for the three cars and 18 tests figured. It was found by A. A. A. representatives that acceleration averages for each of the three cars were less than three-tenths of a second off the grand average of all three cars, showing a convincing uniformity of performance.

The high-speed tests showed an average for the three cars of 61.8 miles an hour. And these speeds were sustained for half-mile periods without damage to the new motors.

"The new piston marks a great advance in internal combustion engine performance," Official Representative Chester Ricker of the A. A. A. said after the tests. "The results mark the piston a real mechanical achievement."

Dealers report that very good sales of this new model have been made and that they have been facilitated by the many refinements. The enclosed job is meeting with favor with motorists, especially those using cars the year around.

"TWELVE TIMES AROUND THE WORLD."

More than 300,000 miles and still going strong! That's the record of a 1908 Franklin touring car, owned by Lew Robertson of Salt Lake City, who says he wouldn't swap his old "Ironside" for all the king's horses.

For the past 13 years the old car, which is still doing valiant daily service, has averaged better than 23,000 miles yearly. According to Robertson, it's still capable of holding a gait of from five to 60 miles an hour with comfort. Mr. Robertson has just completed a trip from Salt Lake City to San Francisco, a distance of 1000 miles, in a little better than 63 hours, averaging a trifle more than 20 miles to the gallon of gasoline.

He has toured all of the western states and various parts of western Canada many times. On one trip through Yellowstone park the car carried seven passengers, as well as bedding, tools and all the paraphernalia of camping.

Concerning tire mileage Robertson has

form. It was in Dallas, Tex., last fall that Mr. Cobb drove this Rajo-equipped Ford against a field of 19 cars of various other makes. On a one-mile circular track he averaged a mile in 47 2/5 seconds, which is better than 75 miles an hour. When

**Ford Special
Equipped with
Rajo Racing
Head Looks
the Part.**



you consider that this car, capable of 75 miles an hour on a one-mile track, should do as high as 100 miles an hour on a straight-away, you can get a real idea of what a speedy car the Ford can be made to be. In fact, there was only one racer at Dallas which was faster than this Ford Special, a 200-horsepower Fiat.

distance as possible, the special engine pan is continued back almost the full length of the body.

The entire car weighs only 940 pounds. The body is entirely of 16-gauge aluminum; the cooling system has a capacity of 2 1/2 gallons. Combination splash and pressure feed oiling system, a water pump and a high-tension magneto are used. The steering gear is of the worm type. The gasoline tank holds five gallons, with regular gravity feed to the carburetor.

RACE-WAY BODY FOR FORDS.

The accompanying illustration shows the Race-Way body for Ford cars, which includes some attractive distinctive features. It is manufactured and marketed by the Race-Way Body Co., Indianapolis, Ind. The body is built of the highest quality 20-gauge polished steel metal throughout. A standard Ford gasoline tank fits in the tail compartment and is easily filled by pulling forward the seat. The tail compartment is floored with metal, making additional room for tools and luggage.

The radiator shell fits the core perfectly without the use of a wire screen as is usual in bodies of this type. The seat and back are fully stuffed and covered with high-grade imitation leather. There is ample room in the seat for two persons to sit comfortably and the passengers have plenty of leg room. The bodies are primed a medium brown color.

The Race-Way Body Co. has been in production for some months and states that it is able to make deliveries as soon as orders are received. The bodies are sold on a guarantee to be as represented or money refunded. Prices are based on pre-war levels.



Franklin Touring Car, in Which Lew Robertson of Salt Lake City Has Travelled 300,000 Miles, Is Still Doing Valiant Daily Service.

had few worries. One tire, put on his Franklin in 1913, gave service up to 1918. He states that he has never kept an exact tab on the mileage obtained from his tires because the speedometer wore out before they did. One tire gave a mileage of 28,000 miles, with the rest turning in an average of better than 20,000 with the exception of one, on which he obtained an adjustment.

THE RAJO RACING HEAD.

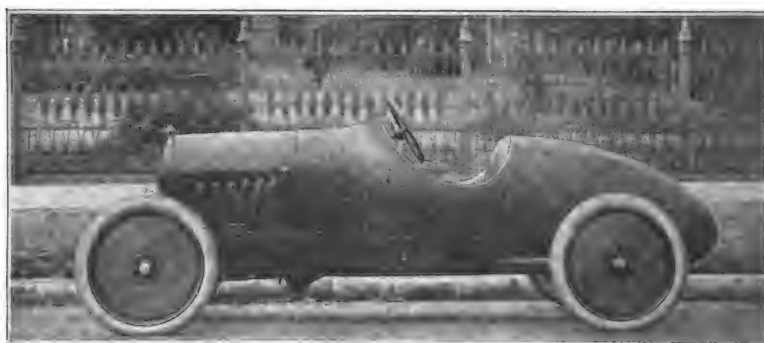
When powerful Fiats, Stutz and other well known racing cars roar around the race tracks at some of the largest state fairs this fall, they've got to step some to show their heels to this Ford Special. Designed by Joe Jaegersberger, president of the Rajo Motor Co., Racine, Wis., and equipped with a special Rajo racing head, it is probably one of the fastest Fords in the country.

This year, like last, it will be driven by Frank Cobb, well known as the holder of the world's automobile jumping record, with a 46-foot leap from an inclined plat-

A great many Ford owners who do not plan on entering their cars in races and who use the standard Rajo valve-in-head more for the greater power, flexibility, etc., it gives, discover that even their regular Ford passenger cars can clip off a mile a minute when thus equipped. Accordingly, at any number of county fairs you see Fords with valve-in-heads walk off with speed honors.

It will be noticed that the center of gravity of the Ford Special illustrated

**Race-Way
Body Has
Attractive
Distinctive
Features.**



GIVES POWER AND FLEXIBILITY

Roof 16-Valve Cylinder Head Perfected for Dodge Motor by Laurel Motors Corporation, Built on Principles of Sound Motor Practise.

FOR more than a year Chief Engineer Robert M. Roof of the Laurel Motors Corporation, Anderson, Ind., has been working on a design for a 16-valve cylinder head for the Dodge motor with the idea of producing a head which, from every standpoint, would meet the commendation of engineers, and give such power, flexibility and road efficiency to the owner of the Dodge car as would be a constant source of pleasure in its operation. A study of the cylinder head, shown in the accompanying illustrations, will reveal the closeness with which all the features of sound motor practise have been adhered to, together with the incorporation of new ideas which nearly five years' experience in developing 16-valve cylinder heads has shown Mr. Roof would be an improvement in the new design.

One of the features always associated with Roof cylinder heads is the finished combustion chamber, insuring uniform compression and reducing vibration, also giving perfect combustion of gases and, therefore, little likelihood of the accumulation of carbon on the walls. The additional power advantages which go with the round combustion chamber instead of the L-head type are enjoyed in the new design, the explosion occurring directly over the pistons, and there is a quicker inlet and exhaust of gases due to the location of the valves over the top of the combustion chamber.

The intake manifold is of seamless brass tubing and designed to accommodate any 1½-inch carburetor with S. A. E. standard flange and is "hot-spotted" through direct metal contact with the exhaust manifold. The gas passages are short and direct to the combustion chamber and are so designed that each cylinder gets an equal amount of gas. Priming cups give direct priming to the intake gas passages and also can be used for vacuum tank connections. The exhaust gases are carried direct to the expansion manifold, there being no winding pas-

sages, therefore reducing the opportunity for back pressure. Connection is made with the regular Dodge exhaust by a special exhaust pipe connecting with the cylinder head exhaust manifold.

Intake Passage and Exhaust Ports of Ample Size.

An important feature that should appeal to racing enthusiasts and drivers is that the intake passages in the cylinder head are of sufficient area to take care of the volume from a 1¾-inch carburetor and the exhaust ports are of ample size to quickly convey all burnt gases regardless of the speed of the motor.

The Dodge head carries 16 1½-inch valves and the increase in valve area over the standard Dodge motor is 2.706 square inches as compared with 1.917 square inches. This Dodge head carries Mr. Roof's new design of rocker arm assembly, reported to be the finest ever put on a motor. The rocker arms are drop forgings with hardened and ground ends and operate on ¾-inch pins. Every provision has been made against undue wear and the design of the assembly and the strength of the various parts insure permanency of service. The valves are actuated from the standard Dodge cam shaft, the push rods carrying ball and socket adjustment, and accurate regulation from the top of the rocker arm is simple and easy for the operator. The new type of valve extensions reduces all chance for side wear on the valve stems.

Realizing that the maximum of efficiency can only be obtained through proper cooling, great care has been taken to provide ample water jacket space in the cylinder head. Each exhaust valve has a separate port and there is a separate water passage to each port, insuring proper cooling to the valves. Tests made by the United States Motor Transport Corps showed a difference of only 10 degrees in temperature with the 16-valve Dodge between 400 and 2500 revolutions, a convincing proof of the thorough cool-

ing arrangement in the design of the head.

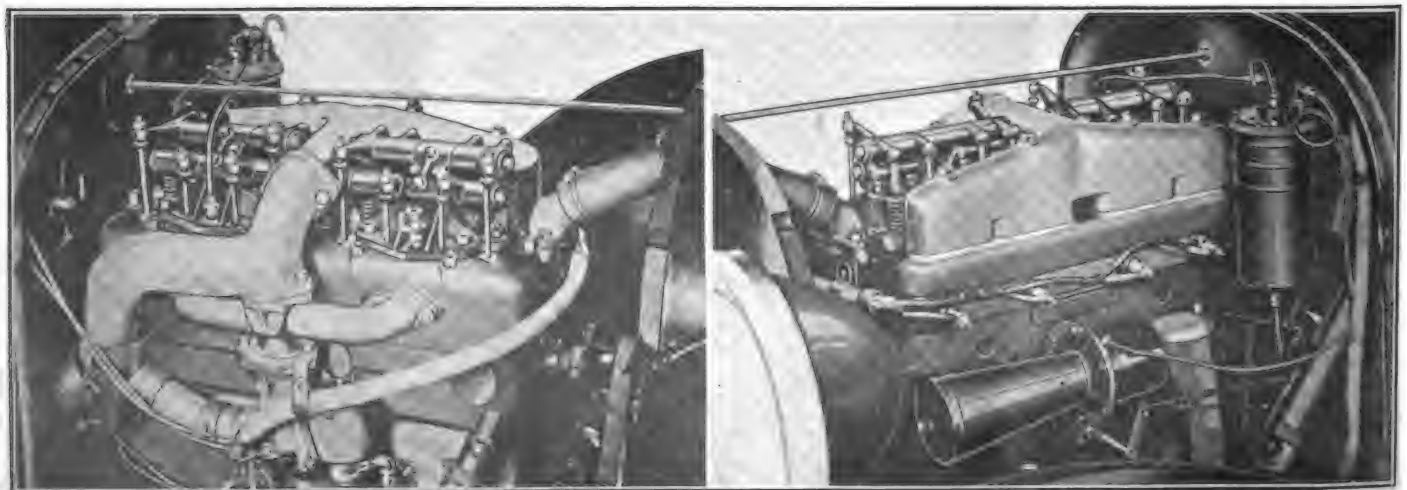
The important features in design heretofore described, with the large increase in valve area, would seem to make apparent to anyone the remarkable increase in power which the 16-valve head gives to the standard Dodge motor. The spark plugs are located on the exhaust side, being ⅞-inch A. L. A. M. standard, the same size as in the standard Dodge motor. The plugs, being set in a recess, have their points flush with the edge of the combustion chamber and no extension plugs are necessary. A special cylinder head gasket goes with each head and the installation is stated to be simple and easy, no machine work being required. The cylinder head casting is of the highest quality, being of semi-steel, and machine work cannot be excelled.

The equipment consists of the cylinder head complete with rocker arm assembly, push rods and all the operating parts, hot spotted intake manifold and exhaust manifold and connections, special cylinder head gasket, ignition wires all encased in metallic tubing and ready for attachment, a complete set of spark plugs and a special type Wheeler-Schebler carburetor with special gas and air controls to give the greatest flexibility.

Actual road tests with the Dodge sedan show speeds of from four to over 60 miles an hour on high gear with the standard Dodge gear ratio, and a pronounced saving in fuel.

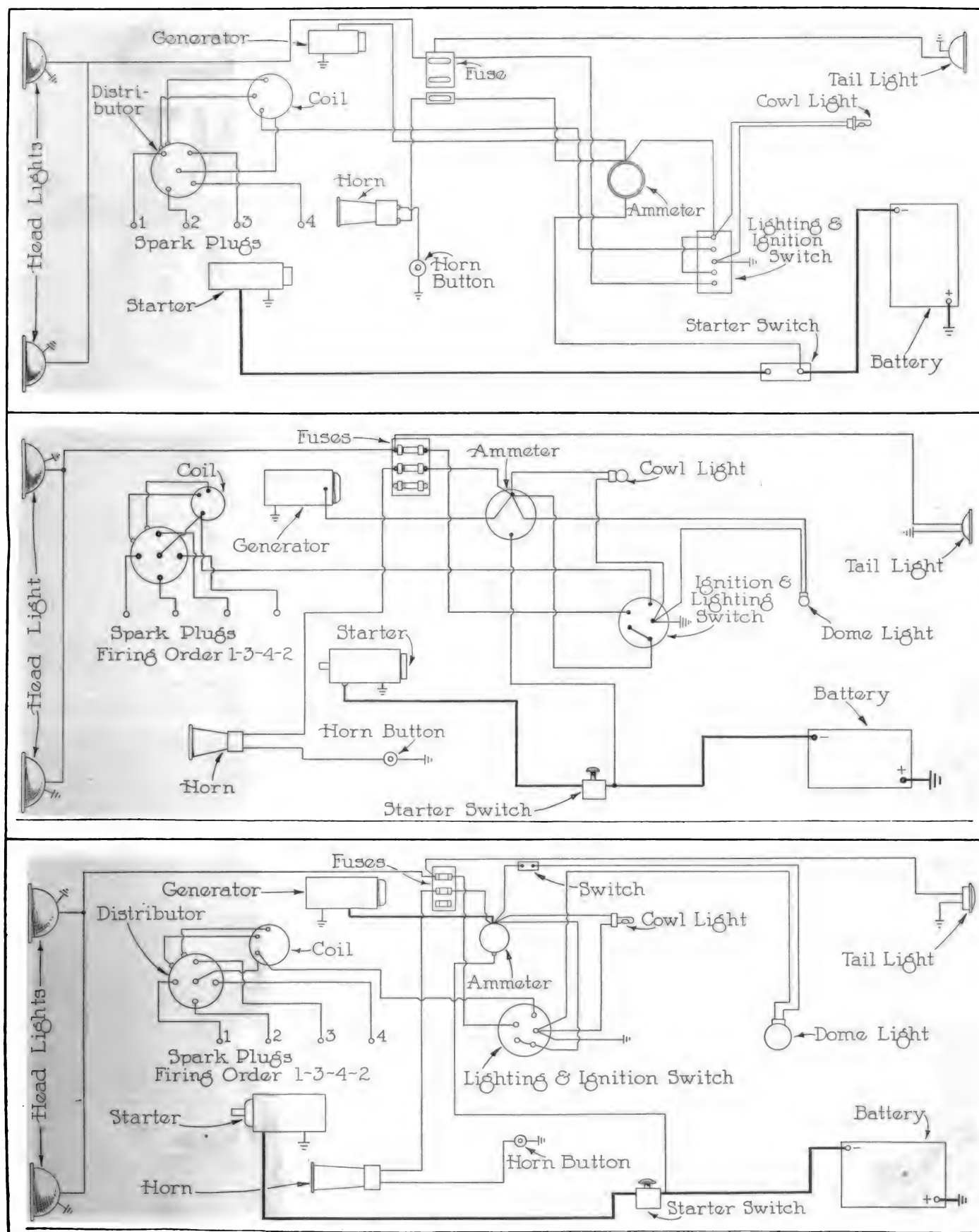
The promoters of Roof 16-Valve Head attachments challenge the comparison of the Dodge car thus equipped with any other car in America, regardless of price from the standpoint of road ability from any angle.

Roof 16-valve cylinder head equipment is manufactured by the Laurel Motors Corporation, Anderson, Ind. The price of the Dodge attachment, complete with 1½-inch carburetor, etc., ready for installation, is \$200.



At Left, Installation of Roof 16-Valve Head on Dodge Motor Showing Intake Side with Exhaust Connection to Standard Dodge Exhaust Pipe and Hot-Spotted Intake Manifold—Exhaust Side Is Illustrated at Right—Note Accessibility of All Parts.

Monthly Wiring Diagram, No. 20

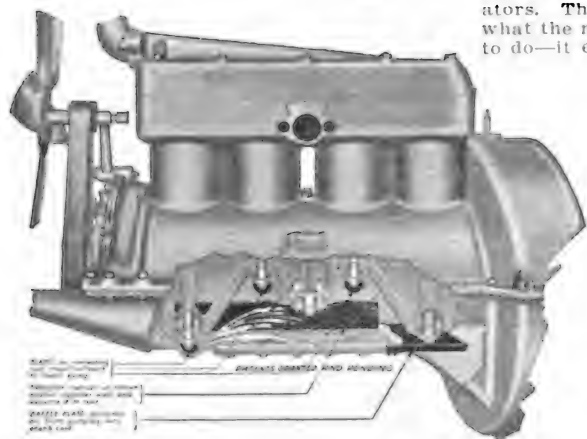


Top, Dodge 1917 and 1918 Models 6 and 9, Westinghouse Starting and Lighting One-Wire System, Connecticut Ignition; Center, Dodge 1919 Models 8 and 11, Westinghouse Starting and Lighting One-Wire System, Connecticut Ignition; Lower, Dodge 1920-1921 Models 10 and 15, Westinghouse Starting and Lighting One-Wire System, Connecticut Ignition.

ACCESSORIES DEPARTMENT

The Jules Oil Circulator for the Ford motor was designed, after years of thought, by one of the country's most experienced automotive engineers. It was patented in 1918, but he has spent the past few years testing and improving it before offering it to the public. It is as simple as it is effective, it is stated. Three tiny blades like the blades of a ship's propeller are attached in a few minutes' time to the three connecting rods of the Ford motor so that they sweep the oil back up hill from under the cylinders to the oil receptacle in the fly wheel housing. The other bearings are lubricated in a bath of oil mist caused by the propeller. A baffle plate, such as is used on the highest priced cars, is inserted to prevent the rear connecting rod in the fly wheel housing splashing up too much oil when the oil surface is surging on rough roads or when the brakes are applied and the oil, by momentum, drowns the front compartments. An oil duct or channel is placed along the right hand crank case wall to convey the surplus oil into the third compartment, and then by the propeller to the main reservoir.

Points mentioned in favor the use of the Jules circulator are that it eliminates the

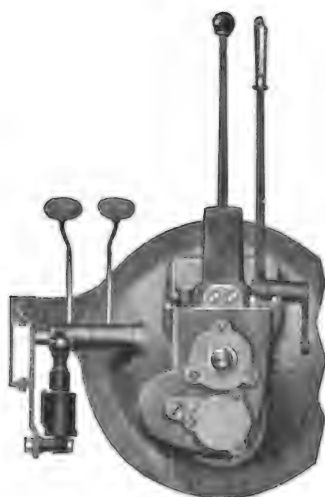


necessity for changing of the piston rings; that it makes cylinder reboring and the changing of pistons unnecessary; that it lessens carbon deposit; keeps the timer free of surplus oil; compels the oil to circulate; will pay for itself in oil saved; does not change or replace the standard Ford parts; is installed entirely through the lower crank case opening; can be installed by mechanic or owner anywhere in half an hour.

The Jules oil circulator is made of cold rolled steel and comes complete for installation with a special wrench and cotter pins packed in an attractive compartment box.

Manufactured by the Electric Machine Co., Indianapolis, Ind. Price, \$4 anywhere.

The Pierce Clutch Governor is a new type of governing device designed for use on passenger cars and motor trucks, as



well as tractors. The object of this new device is to control the action of the clutch, preventing the usual troubles coincident with careless or inexperienced operators. The Pierce clutch governor does what the most expert driver often neglects to do—it engages the clutch gently, with-



out jerk or jar and always does this in the same manner. Resistance to the pressure of the foot is not increased by the addition of the governor, it is stated.

Manufactured by the Pierce Governor Co., Anderson, Ind.

The Badger "All Steel" Creeper is not to be compared in either service rendered or cost with the many creepers that are offered to the garage and repair man. This creeper has been designed and built for the hardest service and to give the mechanic ease of movement and comfort while working under a car.

In its new location, the Badger "All

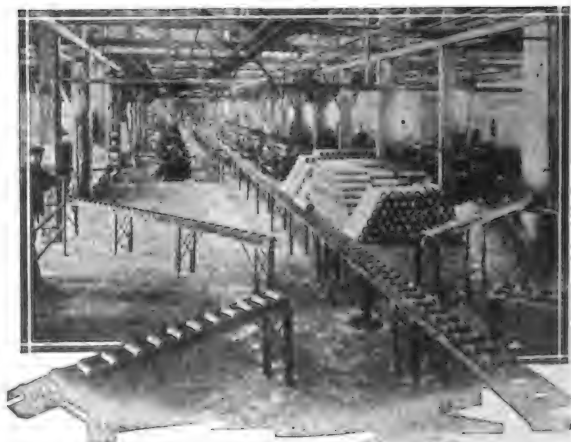
Steel" Creeper is made entirely of metal. The body or the platform is 26-gauge sheet steel and properly shaped to conform to the mechanic's body. The tool trays on either side afford a convenient and handy place to keep his tools. The angle irons supporting the creeper are 1 1/2 x 1 1/2 x



3/16 inches. The cross ties are 1/4 by two-inch bars. The casters are of the pressed steel type one inch in diameter and mounted on roller bearings. The head rest is well upholstered with a durable grade of material that can be easily cleaned when it has become soiled. The different parts composing this creeper are strongly rivetted and bolted together.

Made by the Badger Manufacturing Corporation, Milwaukee, Wis. Standard package, six in crate; approximate shipping weight, 150 pounds.

The Standard Conveyor for factory use



is of the gravity type, which is stated to be coming strongly to the front as an ideal method of handling parts and units from one section of a room or building to another.

Provision is made for shifting the units from one conveyor to another by means of a turntable, located at a convenient point where the conveyors center.

Turning the table allows the units to pass by on to whatever conveyor the operator desires.

Manufactured by the Standard Conveyor Co., North St. Paul, Minn. Prices and literature on request.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

Traf-O-Lite, a new safety device, was designed to be a mechanically perfect stop signal and to serve at the same time as a tail light for any car.

The tail light is in the neck of the lamp and the license plate is illuminated through a water-proof glass opening. Forward rays from the tail light bulb light the red portions above and below the strip on which is the word "Stop" in green. It is stated to comply with all state laws and connects with the standard tail light wiring system of any car. The word "Stop" is not visible until the stop signal is lighted. The stop signal works off the foot brake.



The instant the foot brake is applied a high candle power light just back of the outer lens lights automatically. The glowing red of the tail light grows instantly more brilliant and "stop" flashes on the dark strip in rays of blue green. The contrasting colors make the warning conspicuous even in rain or fog.

A new, simple and effective switch makes its action absolutely certain. A glass vacuum tube in a metal casing contains a ball of mercury. This tube is penetrated by the wires which form the stop circuit. The mercury remains at the end of the tube until the depression of the foot brake changes its position. Then the mercury completes the circuit. The entire action is automatic and it requires no attention after being attached.

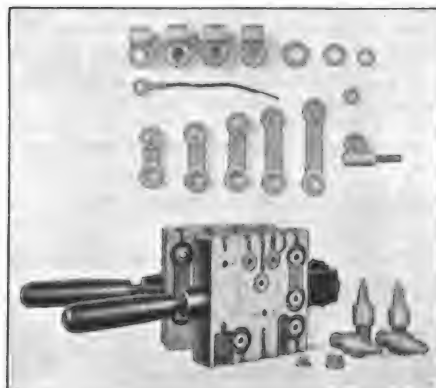
Manufactured by the Automobile Device Co., Cleveland, O. Retail price, \$8.50. Distributed through jobbers and dealers.

The New Washburn Battery Moulds are especially designed for use by storage battery repair men. It is claimed that these moulds have made it possible for the repair man himself to make 90 per cent. of the lead parts used on standard storage batteries and at a minimum cost.

The post strap mould, which is shown in the first illustration, is constructed so



as to enable the operator to cast three posts a minute. The castings are easily removed, the removable tooth rack enabling the operator to cast odd and even number teeth on the post strap to receive the plates, correctly spaced for all standard batteries. By reversing the ends, one is enabled to cast blanks when custom requires. Two bushings are furnished which are bored and reamed to standard



post sizes, fitting the standard rubber covers commonly used by all repair shops.

The second cut shown illustrates the link combination mould which, it is claimed, will not overheat where speed is required. It casts five of the most used connectors for all batteries, using standard jars, 7, 9, 11, 13 and 15-plate, four end connectors (two Dodge tapers and two standard tapers, negative and positive), one end connector, 3/8-inch lead used on 12-volt Maxwell and all other cars having a wire lead, one small wire lead to connect with the end post on a storage battery requiring direct connections. Two post support rings

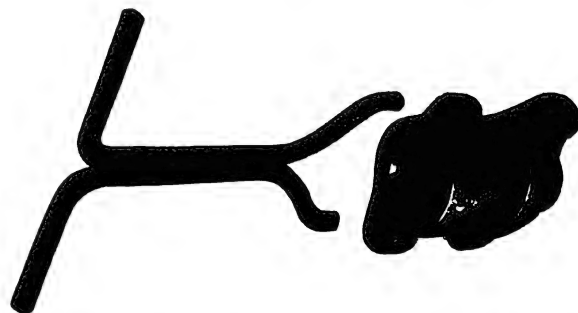


fit the two sizes of standard rubber covers and also fit perfectly all posts cast with the Washburn post mould—two handy washers sometimes badly needed when installing a new or rent battery.

The third illustration shows the "B" mould which casts the end connectors, including the cable lead and two washers.

Manufactured by the Washburn Burner Corporation, Kokomo, Ind. Prices: No. A-233, Post Strap Mould, \$30; No. C-133, Link Combination Mould, \$50; No. B-333, B Mould, \$16.50.

The Lookback Mirror is designed to comply with the law in many states which makes it compulsory for motor vehicle drivers to equip their cars with mirrors which give an unobstructed view in the rear.



The mirror is equipped with a patented ball joint which is a feature of the Lookback mirror and gives to the mirror a greater range of vision as it is positioned near the rim, and allows instantaneous adjustment from the driver's seat.

Manufactured by the Lookback Co., Rushville, Ind.

The Homelite Portable Electric Light and Power Plant is designed to light shop, home, camp or boat with efficiency and economy. It weighs 100 pounds and is easily moved from place to place. It is simple, compact and sturdy in construction.

The Homelite furnishes current for 25-20 watt lamps and will provide power for pumping, grinding, cutting, sweeping, washing, ironing, milking, running drill



press or small lathe. It can also be used to charge automobile batteries. It consumes very little kerosene or gasoline in proportion to the power developed and costs no more for lights than kerosene lamps. Press a button and it starts, and it will stop automatically at any desired time. This is accomplished by a neat small clock which is mounted on the front end.

The Homelite needs no prepared foundation. It is mounted on four springs which take the vibration. A Simms water-proof high-tension magneto provides dependable ignition regardless of the condition of the battery. Ball bearings are used and all parts are of first quality.

Manufactured by the Simms Magneto Co., East Orange, N. J. Price supplied on request.

The Stewart 490 Clutch Puller for Chevrolet 490 and F-A models is built especially for the work it is intended to perform. If the garage owner or repair man has this puller on hand he will not have to lose any time in rigging up something special each time it is necessary to take

out a cone clutch or to replace a clutch spring. With this tool it is no effort to compress the spring and remove the pin from the clutch.

Made by the Stewart Manufacturing Co., Inc., Oakland, Cal. Price, \$5 net.

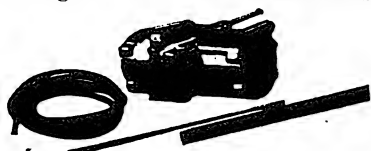
(When Writing to Advertisers, Please Mention the Automobile Journal.)

The Mayo-Skinner Automatic Windshield Cleaner provides for perfect vision automatically during the most severe rain, snow or sleet storms, leaving both hands free to control the car. All that is necessary to do is to turn a little needle valve



on the vacuum motor which is installed on the frame of the windshield, and the cleaning arm, or wiper, starts moving with the regularity of a pendulum, back and forth, continuously cleaning as it moves, giving, it is claimed, as perfect vision to the driver as on a clear day. After once started, it continues to operate, fast or slowly as desired, until shut off.

The Mayo-Skinner Automatic Windshield Cleaner is operated by the suction of the engine. The vacuum motor is sim-



ple and fool-proof and is stated to have met with the highest favor from automobile engineers.

There is positively nothing in the attaching or operation of the cleaner that will affect the engine in any way. The outfit is guaranteed for five years and should give satisfactory service almost indefinitely. The one type fits all cars, whether open or closed.

Manufactured by the Mayo-Skinner Manufacturing Co., 2115 Elston Avenue, Chicago, Ill. List price, complete, \$12.

The Pioneer Garage Special Combined Drill and Valve Grinder was especially designed for garage use. It is equipped with an oscillating spindle for valve grinding and the valve grinding tools are easily slipped out when the outfit is in use for



drilling. It operates on either direct or alternating current.

Its capacity for intermittent duty is $\frac{3}{4}$ of an inch. Its voltage is 110 or 220; its weight is eight pounds and length overall,

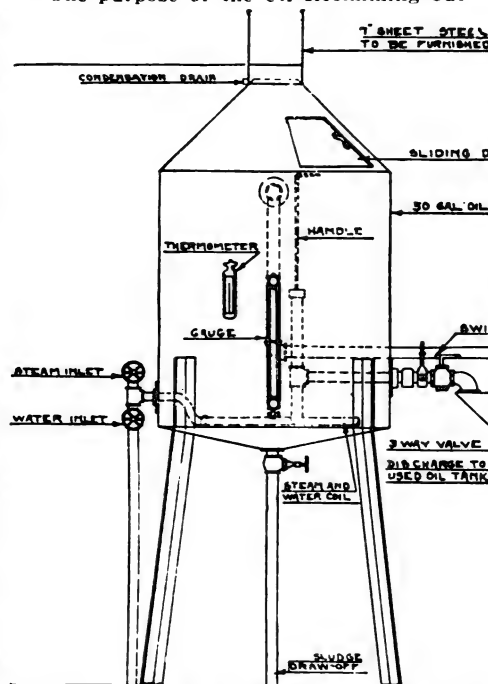
(When Writing to Advertisers, Please Mention the Automobile Journal.)

13 inches; length, with grinder tool, 15 $\frac{1}{4}$ inches; diameter of gear case, 3 $\frac{3}{4}$ inches; offset of spindle from side of frame, 1 $\frac{1}{4}$ inches.

Manufactured by the Louisville Electrical Manufacturing Co., Louisville, Ky. Prices and literature on request.

The Bowser Oil Reclaiming Outfit is a newly designed device for reclaiming used motor oils in service stations and public garages. It has been realized that there is an ever-increasing need for a reliable device which would reclaim oil drained from the lubricating systems of automobile, truck and tractor engines. With the increasing use of heavier engine fuels now being sold to the consumer, the oil in the crank cases of these engines becomes diluted with the heavy unburned end of the fuel. This dilution not only reduces the viscosity of the oil to such an extent that it is no longer a lubricant, but, by reason of the dilution, there is a loss of power due to the increasing friction and loss of compression.

The purpose of the Oil Reclaiming out-



fit is to handle all used engine oil from the garage and, by means of the Bowser process, reclaim the good oil from the sediment, unburned fuel, etc., and to restore it to as near its original viscosity, fire and flash point as it is possible to attain.

Two separate operations are required to achieve this result. It is first necessary to eliminate the diluting ingredients, and, second, all harmful solid foreign matter in the oil must be removed. These two operations are stated to be performed very satisfactorily in the Bowser Oil Reclaimer. Regardless of the degree of dilution or how much foreign matter is present in the oil, the Reclaimer, it is stated, can be operated so as to eliminate both.

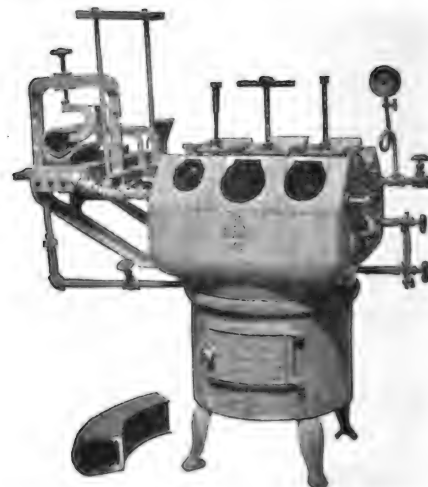
Steam pressure is used to drive out the gasoline present in the oil, the Reclaimer operating on the principle of a still, while other foreign matter is removed by precipitation, a coagulant being added to hasten this.

Manufactured by S. F. Bowser & Co., Inc., Fort Wayne, Ind. Information and literature supplied on request.

Akron Rubbermold Vulcanizer Improved Type A is one of the popular machines brought out this year, designed to accommodate cord as well as fabric tires. This, as shown in the cut, is a three-cavity outfit, with self-contained steam boiler, tube

plate and inside patch vulcanizer attachment.

Type F equipment is also a very good seller in localities where giant truck tires are not in extensive use, as it is designed to accommodate fabric tires only. This is

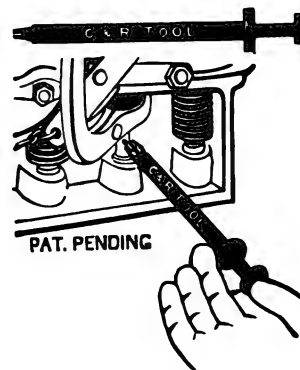


a two-cavity outfit with self-contained steam boiler, tube plate and inside patch vulcanizer attachment.

Another equipment of the Akron Rubbermold, which is in much demand, is the improved Type E Cavity Retreading Vulcanizer. This model will accommodate all makes of tires from three-inch to five-inch cord and fabric tires. It is a self-contained outfit.

Manufactured by the Akron Rubber Mold & Machine Co., Akron, O.

The C & R Tool is designed to save the automobile mechanic tedious labor and valuable time and also to prevent possible injury to the fingers when removing or



replacing valve keys, cotter pins, taper pins, magneto and carburetor parts. It is constructed of Shelby steel tubing and Bessemer steel with end milled in such a manner as to form four jaws. The other



end is fitted with a knurled knob. Between this knob and the knob on the tubing is wound 14 inches of the highest grade piano wire. When the knob on the end is pressed the four jaws protrude from the tubing and open one-quarter of an inch. After the object is placed between the jaws, pressure from the end knob is removed and the jaws firmly hold object, this being accomplished by the spring.

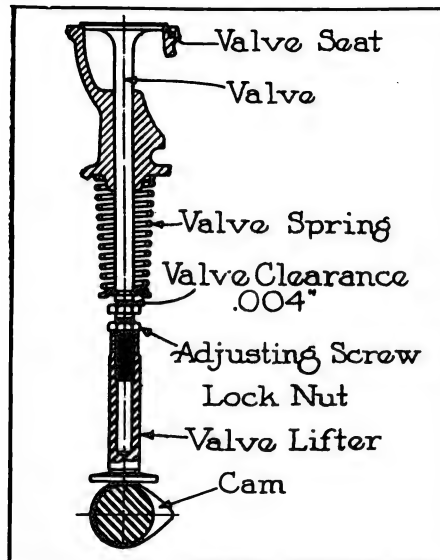
C & O tools are rust proof, being dull silver finished.

For the convenience of the trade one dozen C & R tools and a counter display card are packed in a substantial carton.

Manufactured by the Northwestern Machine Corporation, St. Louis, Mo.; Sales Department: The Wedler-Shuford Co., 19th and Locust Street, St. Louis, Mo.

(Continued from Page 15.)

may have a marked effect on the operation of the engine. The exhaust valve will then open on the suction stroke and burnt gases will again be drawn into the combustion chamber.



Correct Valve Clearance Between Tappet and Valve Stem Gives a Quiet Operating Engine.

Valves Improperly Timed.

Improperly timed valves will cause poor compression and lack of power. The valves are adjusted at the factory and the necessity for changing the timing comes as the result of wear on the valve seats, stems, rods, cams, half-time gears, or by the improper replacement of any of these parts. If the cam shaft has been removed care must be taken to mesh the gears properly when replacing it. The gears are marked so that replacement is not difficult. It will be noticed that there is a prick punch mark on one tooth of the pinion usually and a corresponding mark on the larger gear, or there are two on the larger gear and the single mark on the pinion gear meshes between the two. Before removing a cam shaft examination should be made and if the gears are not so marked it should be done.

If the clearances are properly adjusted for the push rods and valve stems and if the timing gears are properly meshed, the valves should be correctly timed, making allowance for wear on the cam faces. On most engines the positions at which the valves start to open and close are marked on the circumference of the fly wheel. These points should be opposite the pointer, usually at the top of the case, when the valves start to open and close. This time can be determined by the use of a thin sheet of tissue paper. By placing a piece of paper in the clearance space between the push rod and valve stem, one can tell when the valve opens or closes.

Valve setting is an adjustment that should be made by an experienced mechanic or one thoroughly familiar with the principles of the four-stroke engine. The different manufacturers have found by trial the settings that will give the best results with their engines and cars. These settings vary somewhat according to different conditions. If they are not marked on the fly wheel rim they should

be obtained from the manufacturer.

The inlet may open anywhere from top center to 20 degrees of fly wheel motion after center. The inlet closes from 25 to 50 degrees past lower center. The exhaust opens 35 to 60 degrees before lower center and closes from top center to 15 degrees past center.

Too Rich or Too Weak a Mixture.

A rich mixture can be detected by black smoke coming from the muffler, and by the overheating and missing of the engine. Not only is fuel wasted, but the cylinders become fouled and carbonized. A mixture which is too rich at slow speeds can be corrected by cutting down the gasoline, and at high speeds by increasing the auxiliary air. An auxiliary air spring which sticks, a restricted air opening, or a flooded carburetor will cause an over-rich mixture.

A weak mixture can be detected by back-firing through the carburetor and by occasional muffler explosions. A weak mixture, being a slow-burning mixture, is still burning when the intake valve opens for the following charge. This permits the flame to shoot back through the manifold into the carburetor. A weak mixture should not be confused with an improperly timed intake valve which opens before the burning charge has been exhausted. If the intake valve has a weak spring, which does not close the valve properly, it may permit back-firing through the carburetor. The back-firing caused through valve trouble is usually more violent than back-firing due to a weak mixture. A weak mixture at slow speeds is generally caused by too little gasoline and at high speeds by too much auxiliary air. The carburetor should be adjusted accordingly.

Air leaks in the manifold connections will dilute the mixture with air and cause a weak mixture and back-firing. These leaks should be closed before the carburetor adjustments are made.

A stuck, bent or obstructed gasoline needle valve may cause a weak mixture by shutting off the supply of gasoline. The remedy is obvious.

Operating in High Altitudes.

Operating cars or trucks that have been properly set at the carburetor to work satisfactorily in low altitudes will

show a marked loss of power when high altitudes are reached. Cars equipped with choker devices can work fairly satisfactorily without making a change in the carburetor adjustment, but those not so equipped will need to have the carburetor needle valve opened slightly and the auxiliary air valve tightened to work successfully in the higher altitude. The carburetor will have to be reset when the lower levels are again reached to get the utmost economy from the engine in ordinary low level driving.

Weak Spark Caused by Defective Wiring and Ignition.

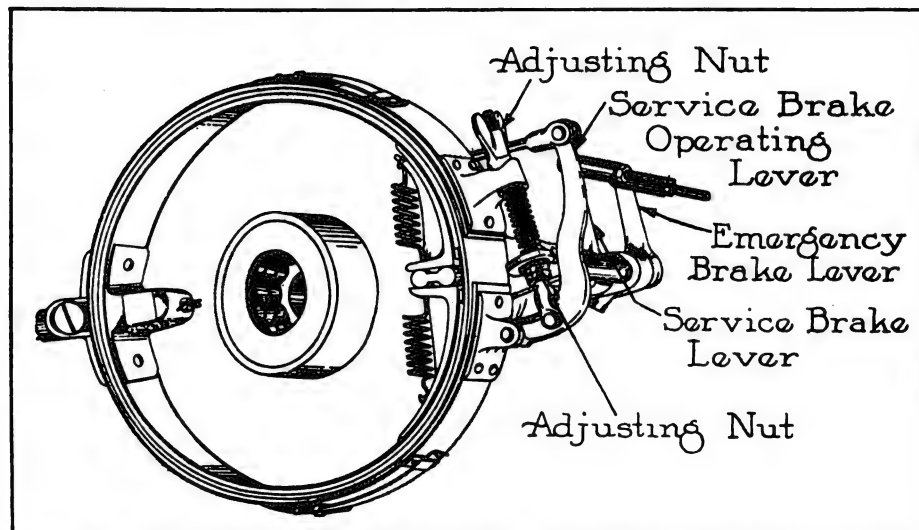
If the plugs are found in good order, and yet one or more cylinders continue to misfire, the trouble may be due to a lack of secondary current in the wire connected to the plug, often termed the plug terminal wire.

The trouble can usually be detected when the engine is running, or being cranked, by detaching the wire from the plug and holding the end about one-eighth to one-quarter of an inch from the plug binding terminal or cylinder head. If the secondary current is being distributed properly to the cylinder under test, a spark will occur at the gap. If there is no spark across the gap and there is regular sparking at other plugs, the trouble is undoubtedly due to defective high-tension wiring, a cracked distributor head or poor timer contact.

If the rubber covering or insulation on the spark plug terminal wires is chafed or cut through, allowing the conductor to touch or nearly touch any metal part of the car, the current will be short-circuited and will not jump the gap in the plugs. It is not necessary that this insulation be worn down to the metal of the conductor. If a sharp snapping is heard when the engine is running under a heavy pull it is evidence of a short-circuit from the high-tension conductor to the frame. The fault will usually be found due to imperfect insulation of the spark plug wires, or a wire loose from the spark plug terminal. The only satisfactory remedy for cracked insulation is to replace the wiring with new.

Irregular Misfiring Due to Defective Wiring.

The irregular misfiring of all cylinders



Brakes Should Operate Freely Without Dragging—Frequent Adjustment Necessary to Keep Them in Good Working Order—Should Be Relined if Worn Excessively.

may be due to defective primary wiring, a discharged battery, a weak magneto, corroded or loose battery connections, improper adjustment of vibrator or interrupter contact points, or a defective condenser.

A common cause for irregular misfiring, when the ignition is from a battery high-tension distributor unit, is improper make-and-break of the primary circuit by the contact points. In a majority of the various systems employed, the contact points are made of tungsten and held closed by spring tension, the spark occurring the instant the primary circuit is broken by the cam lobe bearing against the contact arm. The contact points have a standard opening of .17 to .020 inch, about the thickness of two United States post cards. If found dirty or uneven and pitted, they should be cleaned by passing a fine flat file, or preferably a piece of No. 00 sandpaper between them.

How a Defective Condenser Is Indicated.

A defective condenser is indicated by serious sparking and the rapid burning of the interrupter or vibrator contact points, also by the inability of the coil to produce a hot secondary spark when the primary circuit is interrupted. If these conditions exist, the condenser is probably either punctured (insulation between tinfoil layers destroyed) or open-circuited. The best remedy is to replace the condenser, or the unit in which it is contained, with another that is known to be good. If the condenser is mounted inside the coil, the entire coil usually must be replaced. However, when the condenser is mounted in the breaker housing it can usually be replaced without disturbing the other parts of the system. The action of a good condenser results in intensifying the secondary current nearly 25 times and preventing an arc at the breaker points when they are separated.

Resistance Unit in Primary Circuit.

In many battery ignition systems, a resistance unit is placed in the primary circuit to protect the coil and battery in case the ignition switch is left on, and to aid in equalizing the intensity of the secondary spark at high and low engine speeds. In case the resistance unit should burn out, or for any other reason become open-circuited, the primary circuit is

opened and no current can be obtained at any of the plugs. This resistance unit consists of a small coil of iron wire and is usually placed either on the coil or breaker housing. In case this resistance unit should be burned out or accidentally broken, the terminals may be temporarily short-circuited with a piece of wire to relieve an emergency, but in all such cases the resistance unit must be replaced with another of the same kind as soon as possible. Continued operation without it will result in serious burning of the interrupter points and may cause injury to the coil and condenser.

No Current Due to Coil Trouble.

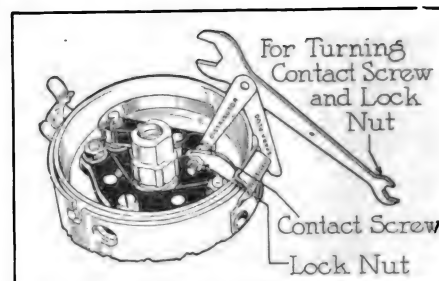
A frequent cause of no current at the plug is due to coil trouble, especially where a vibrating coil is used for each cylinder. When the vibrator points become pitted, out of line, or burned, good contact is impossible. The tension on the vibrator springs may also become changed, permitting the coil to consume too much or too little current.

In the case of burned or pitted points, they should either be made flat with a thin, smooth file, or preferably a piece of No. 00 sandpaper passed between them. In either case the points should be shaped so as to meet each other squarely.

If it becomes necessary to adjust the tension on the vibrators, the tension should be entirely taken off and gradually increased until the engine runs satisfactorily under all load conditions with the coil consuming as little current as possible. It is very important to have all of the units adjusted alike. This can be easily done after a little experience. The most accurate method of coil adjustment is with a coil current indicator by which the amount of current consumed is measured. Coils are constructed to consume about one-half to 1½ amperes; consequently, the tension should be adjusted so that the current consumption of each coil is not much greater than this amount.

If no current is obtained in the secondary circuit of a coil when the vibrator is working as it should, the trouble is probably due to either a broken wire or punctured insulation inside of the coil. It sometimes happens that the binding post wires become loose from the post just inside the coil. If only a slight spark

can be obtained, the insulation on the inside wire may be broken down, thus causing a short-circuit. Obviously there is no remedy but to replace the coil. Moisture in the coil may also cause it to become short-circuited. In this event the coil should be thoroughly dried out before it is put back into service.



Special Gauge Required to Set Points in Breaker Box for Correct Spark Gap.

Ignition Timed Too Late.

Another cause of lack of power is late timing. Trouble in the timer is usually due to oil, water or dirt which has gotten into the housing, causing either a short-circuit or poor contact. This foreign matter should be cleaned out of the timer in order to permit it to give good service. After a time the contact segments in the timer become worn and irregular, causing misfiring at high speed. In this event it will be necessary to supply a new timer.

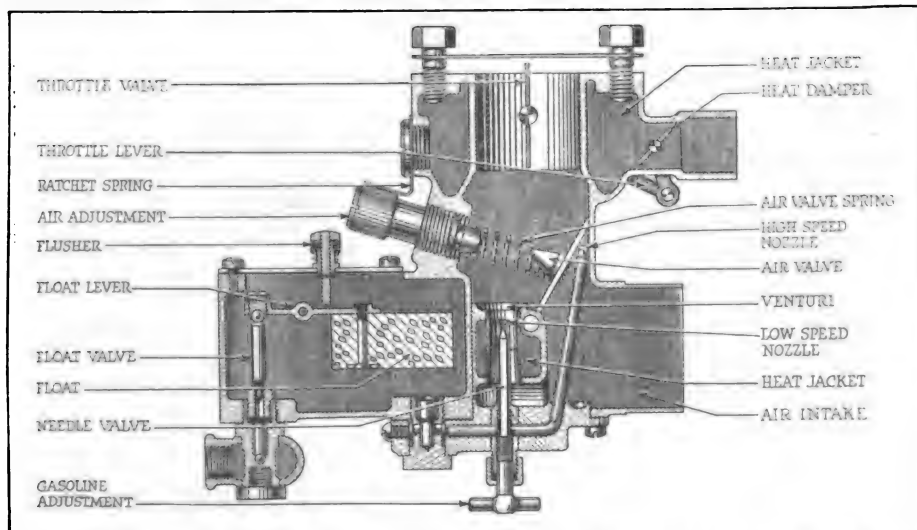
If the engine kicks back after cranking the spark is too far advanced and should be retarded so that it will not occur until the piston has passed the dead center. The tendency of an early spark on starting is to cause the engine to start backward. Too early a spark at low speeds will make the engine knock and will cause the car to jerk.

A retarded spark causes the engine to overheat and lose considerable of its power. There is no advantage gained in retarding the spark past center, even in starting. When the engine is running, the spark should be advanced in proportion to the speed. With the spark lever fully retarded, the interrupter points should be timed to open (thus causing the spark) when the respective pistons are on upper dead center at the end of their compression strokes.

On cars equipped with automatic spark advance, the troubles due to early and late spark are seldom experienced, providing the original timing of the spark was correctly made. Preignition from other causes, however, may occur with either type of spark advance.

Lack of Lubrication.

The lack of sufficient lubricating oil or the presence of too large a quantity will cause loss of power which is often hard to trace. The usual lubricating troubles are due to the use of the wrong kind of lubricating oil or too much or too little of it. An engine with loose-fitting pistons requires a heavier oil than does one with tight-fitting pistons, and an air-cooled engine usually requires a heavier oil than a water-cooled unit. It is very essential that a true gas engine cylinder oil be used for cylinder lubrication because it alone satisfied the requirements. Poor lubricating oil is expensive at any price, and it is good economy to use the best



Sectional View of Marvel Carburetor, Indicating Units and Adjustments—Common Troubles Caused by Dirt or Dust in Fuel—Clean Strainers in Fuel Line.

cylinder oil obtainable. In this matter the recommendations of the manufacturer should be followed.

An excess of lubricating oil shows itself by a white bluish smoke coming from the muffler. In addition to this, an excess of lubricating oil causes the formation of a pasty carbon deposit in the combustion chamber, which eventually causes the engine to overheat.

The important things to look after are to be sure that there is sufficient supply of oil and that the oil pump is in working order. The crank case should be drained, washed out with kerosene, and new oil supplied every 1000 miles of travel.

Lack of Cooling Water.

Poor circulation in the cooling system is one of the common causes of loss of power and when neglected is liable to give the motorist many uneasy moments. The water system must be kept filled with water. This is of special importance in the thermo-syphon system, in which the water level must at all times be above the top of the return pipe from the engine to the radiator in order to have the circulation complete.

A worn pump may cause poor circulation, because in most cases the thermo-syphon effect in a forced system of circulation is not enough to keep the water moving at the proper rate.

Sediment in the radiator and scale in the engine jacket may interfere seriously with the circulation of the water. Such clogging of the system comes from the heating and cooling of the impure water used. This emphasizes the desirability of using pure water or rain water in the radiator. The sediment and hard scale may be removed as follows: Open the drain cock in the bottom of the radiator and introduce the end of a hose in the filler of the radiator. Run the engine for about 15 minutes. The fresh water from the hose will clean out the loose sediment and scale in the water jackets and radiator. By using this method a supply of fresh water is constantly entering the system and passing through the water jackets while the engine is running.

Next, put as much ordinary washing powder as can be dissolved in the water necessary to fill the radiator. Then run the engine with a retarded spark until the water is heated to the boiling point. Allow this solution to remain in the engine and radiator for several hours, after which open the drain cock and with a hose, again flush out the entire system with fresh water as before. In extreme cases it would be well to repeat this process several times. The final operation of flushing out with fresh water should be thoroughly done. If any of the washing soda solution is left in the engine jacket or radiator, an undesirable chemical action may result.

When rubber hose forms a part of the circulating system, a kink or twist in the hose may possibly result in the poor circulation of the water. The inside fibers of the hose also tend to become loose and may clog the system.

In the case of thermo-syphon cooling systems, or air-cooled engines, the operation of the fan is essential to the successful operation of the cooling system.

If the fan belt breaks or slips, or the fan blades are bent, the air circulation through the radiator is interfered with and, consequently, the water is not properly cooled.

Lack of Gasoline.

Loss of power through lack of fuel is a common occurrence which indicates itself by a popping sound in the carburetor and the irregular operation of the engine. The car will forge ahead for a few feet, the engine will fire irregularly, spit back into the carburetor and eventually come to a stop. If at a distance from a garage where fuel is sold, stand on the running board on the carburetor side and rock the car; this will fill the carburetor float chambers, if a gravity system is used, sufficiently to run the car for a short distance. The gasoline feed pipe usually leads out from one end of the fuel tank and some of the liquid is usually found in the opposite end, tipping or rocking the car allows this fuel to run through the feed pipe and to fill up the carburetor bowl. Lack of gasoline may also be caused by an obstruction to the flow in the strainers of the fuel line or to specks of dust under the needle valve. Removing the strainers and cleaning them will remedy the former and turning the needle valve down on its seat several times will grind out the dust particles in the latter.

When the vacuum system is used and the flow of gasoline stops, the cause may be usually traced to some fault in either the fuel line leading from the main tank in the rear, a clogged opening in the tank cover, or to some local trouble in the vacuum tank.

Examine the fuel line from the main tank to the vacuum tank, removing kinks in the pipe, if found, and testing all joints to see that they are tight. Remove the cover on the main gasoline tank and run a wire through the air opening in the cover so that air may enter the tank as the gasoline is drawn out. Remove and examine the strainer on top of the vacuum tank as this may have become clogged with lint, etc., from the main tank.

If the trouble is traced to the vacuum tank itself and one is positive that the trouble is here, remove the interior mechanism of the tank and examine the flap valve at the lower end of the top, making sure that it seats properly and that the seat is clean.

Dragging Brakes.

Relined brakes or brakes that are set too close are a source of lost power, which soon causes overheating and the power of the engine to apparently lag. It is necessary that the brakes be kept in perfect working order at all times. If the brakes fail to hold it may be that the drum and band facings have become covered with oil and dirt, or the band facings may be worn. In the latter case new facings are necessary in most cases, but adjustments can be made for slight wear.

The brakes may bind or stick, due to too tight adjustments. With tight adjustments, the engine pulls the car against the friction of the brakes.

If the brakes are not adjusted equally on each side of the car there will be a tendency to skid when the brakes are applied. The braking effect then comes on

only one wheel and this tends to swing the car around. Many cars are provided with brake equalizers, which require them to work together.

Slipping Clutch.

Clutch troubles are about the same in either the cone, plate or multiple-disc types. The clutch either slips, engages harshly, grabs or refuses to release. If it slips the full power of the engine is not transmitted and the clutch becomes hot from friction. In the cone and dry-plate types, a coating of oil on the facings will cause slipping. Wear of the facings or weak or broken springs will produce the same result. If the slipping is caused by grease and dirt the clutch leather should be thoroughly cleaned with gasoline, after which, if the clutch still slips, fuller's earth may be applied or the clutch adjusted. If wear is present in the facing of the clutch the simplest method of restoration is to remove the old facing and replace it with new.

If the clutch engages too harshly or grabs suddenly it may be due to the drying out or hardening of the clutch leather. A dressing of the facing with neat's-foot or castor oil will make it soft and permit gradual engagement. If the clutch springs are too tight the clutch will drag and burn the facing. If a multiple-disc or plate clutch is designed to work in oil, it will engage harshly or grab if the plates become dry. The clutch will also fail to disengage when the pedal is pressed down.

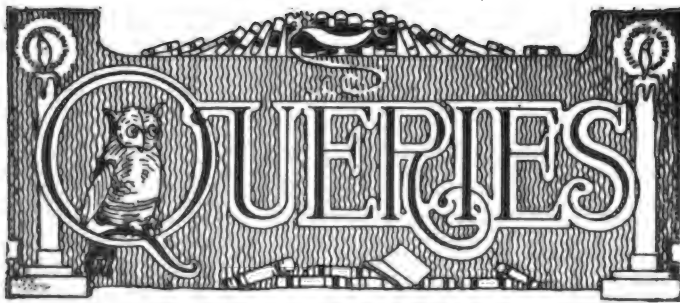
Multiple, dry-disc clutches will slip if the foot is allowed to rest on the clutch pedal. A light clutch spring is used with this type, the discs being held in position more by the friction of the friction facing than by the tension of the spring. Riding the clutch pedal is to be avoided in this type, and if the slippage is too great, causing the engine to race when travelling over a grade, the clutch can be adjusted by means of the three clutch adjustment bolts that hold the clutch plate assembly.

If the change gears stick, when an attempt is made to shift from one speed to another, the shifting members may be stuck on the splines of the shaft. If the gears have become burned or teeth have been broken out, the particles of metal may prevent the movement of the sliding member. Occasionally the shifting lever becomes stuck and will not operate the gears. Under ordinary conditions the change gears should make very little trouble if due attention is given to the lubrication, and to their shifting in operation.

Choked Muffler Causes Back Pressure.

The use of the muffler causes a slight reduction in the power of the engine because the pressure against which the gases must enter into the exhaust manifold is increased. A muffler is a chamber in the exhaust pipe which receives the gases from the engine and expands them gradually into the outside air, thus preventing a loud noise.

Oily carbon deposits from the engine combustion chambers form on the baffle plates of the muffler and the drilled holes in the plates gradually fill, choking the free passage of the gases and causing increased back pressure.



CLEANING CLOTHING SOILED WITH GREASE.

(J. A. W., Cincinnati, O.)

Kindly tell me how I can remove oil and grease spots from a duster which I wear when driving my car. The spots show plainly especially if there is much dust.

People were just beginning to learn that ether was very useful in removing grease spots from clothing and other textiles when the war created a shortage of it and gasoline again had to be resorted to, notwithstanding it had doubled in price, and left a residual odor on the goods that wasn't pleasant.

For a long time ether has been used in cotton and woolen mills for removing spots from new cloth.

Ether can be purchased in drug stores in half-pound cans. It is not expensive, but is very volatile. After taking the required amount from the can the container must be tightly closed as soon as possible, otherwise it dissolves into thin air.

Ether is inflammable and should not be used near an open flame or an open fire, nor in a closed room where the ventilation is not good. The same care should be exercised in its use as in the use of gasoline, benzine and like products.

CHANGING ENGINES.

(E. J. S., Somerville, Mass.)

I have had oversize piston rings put into my Ford engine, but it is still very weak on hills and pumps oil badly. The garage people advised regrinding the cylinders, but I did not have it done. Could an engine of some other make be installed in place of mine and give better results than a regrinding job?

It is hardly practical to substitute an engine of another make for yours, as no two engines are interchangeable and the substitution can be made only at great expense and trouble. Probably the advice as to regrinding was sound. Such a job is not inordinately expensive and, when properly done, makes an engine nearly as good as new. When cylinders are worn much out of round, oversize rings do not do

much good, as they do not fit the cylinder walls all the way around. Even a new cylinder block and pistons would be much cheaper than a new engine. If your car did not climb the hills in your vicinity when new, you can perhaps gear it lower by putting in different final drive gears, which will give you better climbing power.

PROPER OIL FOR OLD ENGINES.

(G. O. F., New York.)

Recently I purchased a 1915 — car that had probably seen about 20,000 miles of service. The engine smokes badly and I have wondered if it were possible to overcome this difficulty in some manner.

After an engine has seen reasonably long service so that the pistons do not fit as closely in the cylinders as they did when the engine was new, it is advisable to use a heavier oil in order to seal the pistons and rings so that they will hold compression. In racing engines, where the piston to cylinder clearance is often more than twice that in ordinary practise, the drivers use heavy oil. High viscosity lubricants, such as castor oil or mixtures of castor oil and mineral oil, are favorites for racing engines.

INSPECTION WINDOW.

(S. G. W., Woods Hole, Mass.)

Is there any positive way that I can tell if oil is passing into the oil tube from the fly wheel in my Ford car? Oil is apparently circulating, but I would like to see it as it passes into the tube.

An ingenious car owner who had trouble because of stoppage in the oil tube which runs from the transmission case of the Ford to the timing gear set at the front of the engine, inserted in the transmission case a small mica window about two inches in diameter. The window is secured by a steel ring, 1/32 of an inch in thickness, and is held in place by round head screws. A felt gasket is placed between the mica and the case and the upper side of the mica is lightly coated with shellac. Possibly this will answer in your case.

CHANGING TIRES GIVES ADDITIONAL WEAR.

(S. A. B., Worcester, Mass.)

The rear tires on my — car are showing signs of wear. Should I throw them away and purchase new, or can I get further use from them?

After the rear tires have had considerable wear, interchange them with the front tires, reversing the sides in changing. The tractive strain of the rear wheels make it advisable to place new tires on the rear wheels, moving the old tires forward where the wear is less severe. Some of the greatest tire mileage records known have been made in this manner.

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STARTER GEAR LOCKS.

(W. N. J., Baltimore, Md.)

When I press my starter button the engine is not turned over and when I try cranking by hand I cannot do so, as the gears of the starter are locked. The only way to loosen them is by rocking the car back and forth violently, when they are locked, or to remove the starting motor entirely. I have just put on a new fly wheel and have had the starter off several times. What is the matter?

From your description we are led to believe that your trouble is caused by faulty meshing of the gears. In installing the new fly wheel you probably put in a new starter ring gear also, and when you tried meshing this gear with the worn gear of the starting motor the gears stuck, which is a natural thing to expect. Probably both gears are not of the same pitch and depth of tooth. This would still further add to your trouble. You state that you have removed the starting motor several times and probably you have not meshed the pinion of the Bendix drive of the motor properly with the starter ring gear of the fly wheel. Attention to these details and installing a new pinion gear should remedy your trouble unless the threaded end of the Bendix drive shaft is bent, which would also cause the gears to stick.

This trouble is purely local and should be taken care of by an expert repairer. Have the motor armature shaft removed from the motor and tested in a lathe to see if the shaft runs true; especially the threaded end, where the pinion slides in and out on a long thread. Roughness of the threads or a bend will prevent the gear from slipping out of mesh with the starter ring gear and cause the trouble you mention.

LOW WATER.

(A. H. H., Chicago, Ill.)

I have a slight leak in my water circulating system which allows the water to lower after driving awhile and causes the engine to heat up slightly. What will happen if I do not keep the radiator filled up?

Operating an engine without sufficient water or with no water at all may result in injury to the spark plugs. To give service without cracking, the plugs must be properly cooled, and provision for this is generally made in the water-jacketing system. When the water runs low the plugs become hotter and there is great danger of their being damaged.

TRANSMISSION NOISE.

(I. S. C., Canal Dover, O.)

I will start by admitting that I haven't taken the very best care of my car, which is a 1916 ——. Of late, among other things, I have been bothered with a humming noise somewhere in the vicinity of the gear box. From this meager description can you give me any idea of the cause?

A humming noise in the transmission case is very likely due to an excess of heavy grease. The case should never be more than two-thirds full, and steam cylinder oil is the correct lubricant, not grease. It is a foregone conclusion that a noise in the gear box means faulty lubrication. Where you mention that you have not taken any too good care of your machine, I am inclined to think this is your trouble.

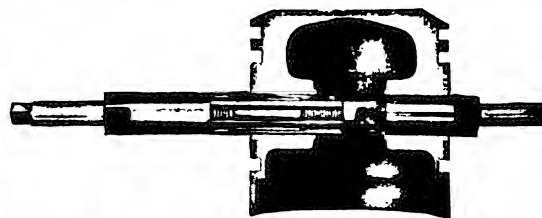
USING PARKING LIGHTS.

(E. L. B., Pittsburgh, Pa.)

What is the simplest and most economical way to use the car lights when leaving it standing in well-lighted districts at night?

In order to save current a great many motorists are making use of parking lights. These are small, two-candle power lights usually attached to the rear fender to show red to the rear and white at the front. If these are used in sections otherwise well lighted the motorist does not have to use the current that is required to keep the dimmers and tail light going and the current consumption is so small as to be hardly noticeable.

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUG. 24, 1912, OF

THE AUTOMOBILE JOURNAL,

PUBLISHED MONTHLY AT PAWTUCKET, R. I.

For October 1, 1921.

State of Rhode Island, County of Providence.

Before me, a Notary Public, in and for the state and county aforesaid, personally appeared William H. Black, who, having been duly sworn according to law, deposes and says that he is one of the owners of the Automobile Journal and that the following is to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the act of Aug. 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor and business manager are:

PUBLISHER, WM. H. & D. O. BLACK.....Providence, R. I.
EDITOR, W. B. WATSON.....Pawtucket, R. I.
MANAGING EDITOR, S. G. SWIFT.....East Providence, R. I.
BUSINESS MANAGER, WM. H. BLACK.....Providence, R. I.

2. That the owners are:

WM. H. BLACK.....Providence, R. I.
D. O. BLACK.....Providence, R. I.

3. That the known bondholders, mortgagees and other security holders owning or holding one per cent. or more of total amount of bonds, mortgages or other securities are:

M. J. BLACK, Mortgagee.....Providence, R. I.

4. That the two paragraphs next above, giving the names of the owners, stockholders and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholders or security holder appear upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association or corporation has any interest direct or indirect in the said stock, bonds or other securities than as so stated by him.

(Signed)

WILLIAM H. BLACK, Co-Partner.

Sworn to and subscribed before me this 5th day of October, 1921.

(Signed)

THOMAS BESWICK, Notary Public.

[Seal]

(My commission expires June 30, 1923.)

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CARE OF VACUUM TANK.

(S. G. S., Birmingham, Ala.)

Can you give me directions for the care and maintenance of the vacuum tank used on the modern automobile? The tank on my car has not been taken apart for some time and I feel that it may need overhauling, but do not know just how to go about it.

It is very unlikely that internal repairs will ever have to be made to the vacuum chamber of the vacuum tank, as it is of very simple construction and there are not many things which could interfere with its functioning.

Before any attempt is made to take the tank apart, the owner should be positive that it is the cause of trouble. It is always possible to test the tank by opening the pet cock at the bottom and if no more than one-sixth of a quart of gasoline flows out, it is certain that the system is performing its function properly.

Running the engine at slow speeds with an open throttle for a long time such as in ascending a long, gradual hill, may reduce the vacuum to a sufficient extent that the tank will empty itself, or this condition might result from dirt or foreign matter getting in and clogging the gasoline feed tube; that is, the lead from the tank to the vacuum tank.

If it is a case of insufficient suction, this can always be cured by letting the engine run with throttle closed up a few moments, after which sufficient suction will be created to fill the tank almost instantly.

In case the float valve leaks for any reason, which would cause an overflow of gasoline from the tank either through the vent pipe or some other portion, the inner shell can be taken out by removing eight screws at the top of the tank.

The tank may then be filled with gasoline and will act as an ordinary gravity system, enabling the owner to drive to the nearest garage where the float may be repaired.

In taking off the head of the tank, after removing the eight screws, care must be taken not to damage the gasket, as in replacing the head it is necessary that the joints be kept airtight. This gasket is shellacked.

Should the tank ever become entirely empty it may be filled by closing the engine throttle and turning the engine over a few revolutions. This will create a sufficient vacuum in the tank to fill it. If the tank has been allowed to stand empty for a considerable time and does not readily fill when the engine is turned over, either sediment or dirt has accumulated under the flapper valve, or the valves are dry. To overcome this difficulty, remove the plug at the top and squirt a little gasoline into the tank. This will wash the dirt from the valve and also wet the valves and cause the tank to work immediately.

The flapper valve sometimes accumulates a black deposit, which may tend to hold it from being kept tight to its seat. In this case the valve should be scraped with a knife. This trouble can be detected also by the overflowing of the tank as, if the flapper valve is not tight on its seat, gasoline will continually leak from the upper chamber to the lower.

LOCKING CAR TO PREVENT STEALING.

(A. S. K., Joplin, Mo.)

Is there a simple method of locking a car to prevent theft that does not employ a lock? It seems as though there should be some system whereby the average owner could lock the car by means of the ignition that would prove effective.

Nearly all of the modern cars are now fitted with a battery ignition system in which the distributor arm is removable. By removing this arm the car owner makes it impossible for a thief to steal his vehicle except by towing it away or by fitting another distributor arm. The arm may be removed by simply unclipping the distributor cover to which the high-tension wires are attached. It usually happens that there is only one way in which this arm will fit, so that there need be no worry about replacing it again.

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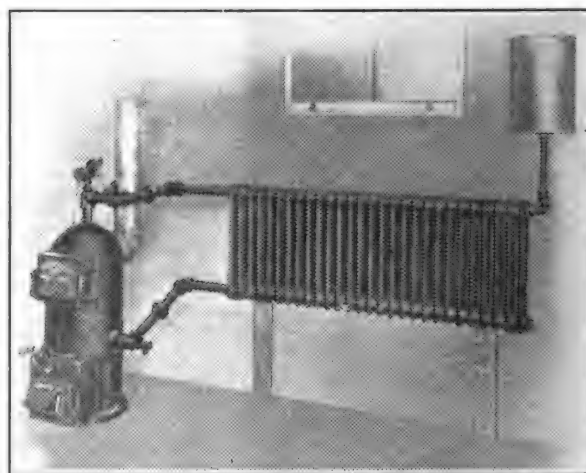
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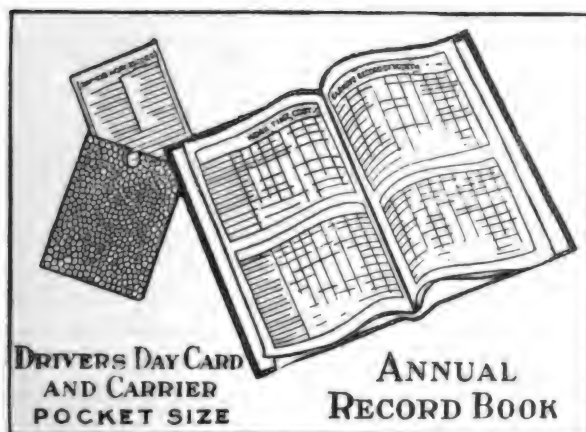
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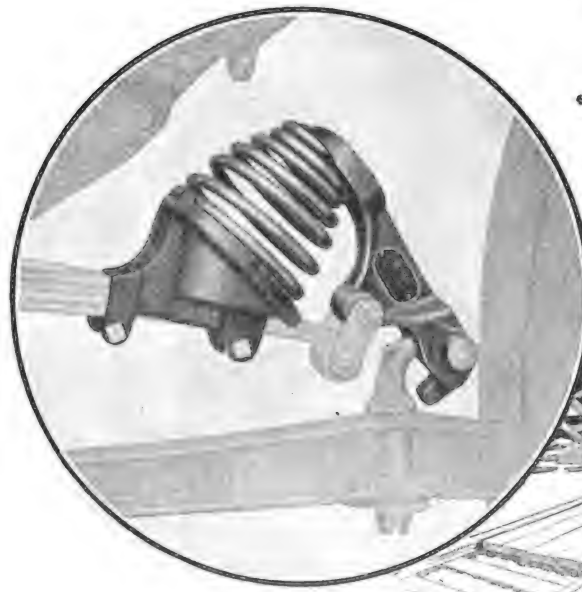
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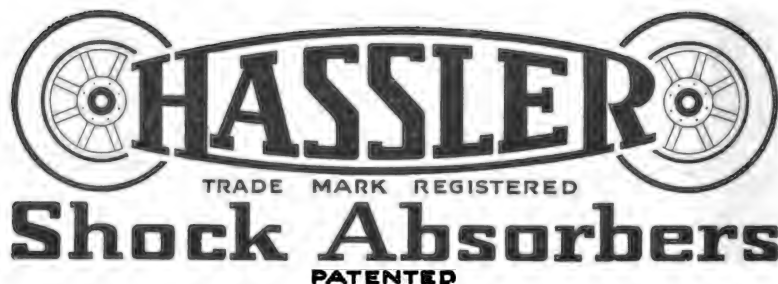
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THE AUTOMOBILE JOURNAL

VOL. LXIX.

PAWTUCKET, R. I., NOVEMBER, 1921.

NO. 4.

Making a Success of the Used Parts Business

PROVIDENCE CONCERN A PIONEER IN THE RECLAIMING AND
MERCHANDISING OF UNITS FROM DISCARDED AUTOMOBILES
MODERN SALES PLAN HAS BUILT UP ENVIABLE TRADE

THAT the used parts business can be conducted in a systematic manner and thus be made to pay a handsome profit on the investment is amply proved by a visit to the plant of the Setchell Auto Parts Co., located at 1296 Broad street, Providence, R. I. This plant is claimed to be the largest of its kind located east of Chicago, and caters to trade covering a large territory from Nova Scotia on the north to Florida on the south and New York state on the west. The business is carried on by Charles K. Setchell and his son, George Setchell. The plant occupies a strategic position between Broad street on the west and Eddy street on the east and covers several acres of filled ground which originally was used as a dump. A part of the dump still remains and proves a handy place to dispose of car parts which are unsalable, such as broken bodies, tops, rusted mudguards and other parts unfit for further use.

THE establishment is located on a main thoroughfare between the west shore routes and the city of Providence and is within 24 hours' shipping distance of all the important cities and towns in New England. The buildings are of cement block construction, equipped with wooden roofs covered with tar and gravel, making them practically fire-proof, while the floors are of cement, preventing moisture from entering and rusting stock.

Several buildings form the plant, a large structure on the north being used for the storage of purchased cars, which are held till they can be examined and decision made as to whether they shall be torn down for the parts or repaired and sold again. The main building consists of two parallel wings joined at one end, having a drive way between. On either side of the drive way the wings are

divided into stalls for the storage of owners' cars and rent for \$10 a month. The right wing is fitted for stalls on both the outer and inner sides, being divided

each stall is equipped with running water, electric lights and steam heat, there is always a waiting list for vacant stalls, which goes to show that tenants are very

appreciative of the service rendered. A common wash stand and repair shop is located in the end building, in which tenants may wash their cars or make repairs and adjustments.

The opposite side of the north wing is also divided through the middle and the north side is used for disassembling cars and the storage of parts. The building and wings, including the offices at the ends facing the street are 200 feet long. Several workmen are employed the year around in disassembling the cars and tagging the parts to go into stock.

Where Parts Are Obtained.

About 500 cars are handled yearly, which are purchased wherever available, a standard of price being maintained, ac-



Showing Main Office (Left) and Car Sales Room (Right) of Setchell Auto Parts Co. Insert, George Setchell, Junior Member, Who Handles Active Business of the Company—Mr. Setchell's Expert Knowledge Stood Him in Good Stead During the World War in Which He Held an Executive Position with the Supply Department of the United States Navy—He Knows Automobiles from the Ground Up—And Then Some.

through the center and provided with a separate drive way on the south side. There are 27 of these stalls in all, with a total rental value of \$270 a month, and as



This illustration shows a portion of the individual garages from which the company derives a handsome revenue.

cording to the year, model and make of car. This price does not vary with respect to the condition of the car, as a consequence of which many machines are obtained that, with slight repairs, can be sold at a fair profit.

Many of these cars have been in accidents. Others have been through fires and still others are obtained from dealers who are often caught with old cars on their hands which they have been obliged to take in trade on which the sales value is so low that there is practically no market in resale. Owners frequently have cars which are so old that they have no sale value except at a junk price, or the owner needing money badly and not being able to run the car, is forced to sell his car for whatever price he can obtain.

These cars have still many thousand miles of inbuilt service in them and, but for the used parts man who buys them at his price, tears them down, salvaging the parts that are saleable and storing them in such a manner that they may be easily reached for resale or for use in repairing other cars of the same make and year, these parts would find their way to the junk pile to be melted over again into new stock.

Salesroom and Stock Departments.

A salesroom is maintained in the street end of the south wing in which these cars are exhibited and sold to purchasers. The income from this source is considerable during the year and helps materially on the yearly turn-over.

The office facing the street is used principally for the sale of parts, a miscellaneous stock being kept in show cases at all times for the benefit of intending purchasers, the stock including used spark plugs, electrical units, gears, axles, springs, fenders, tires and other parts.

A trip through the several stock rooms reveals the fact that the stock is tagged with the year, model and make of car from which it was taken and all parts for that make of car are kept together on racks fastened to the floor and walls. Such parts as rear end housings, axles and springs are kept in the long wing in the rear of the office, while smaller parts, such as gears, clutches, radiators, guards, lamps, etc., are stored in the cellar underneath the office.

More bulky parts such as frames, com-

plete axle units and wheels, engines, etc., are stored in compartments adjoining the building where the cars are taken apart. In this department the same good order is maintained and the salesman can tell at a glance the selling price of a unit without consulting a printed list. The stock of frames consists of a large store running from the earliest models to those of the current year, and the same condition is also true of the complete axle unit stock, while the general stock is practically as complete. One would imagine that calls for used frames would be few and far between. The manager states, however, that he receives calls for this material daily from all sections of New England and in some instances as far south as Florida and very often from points in Nova Scotia. Local trade is also very good, many persons finding here parts which they require in overhauling their machines at a very reasonable price.

Many of the parts redeemed in this manner are practically as good as new as they are often taken from cars that have been through a serious accident or through a fire which has only burned off the body and top leaving the chassis unharmed.

Used parts are offered for sale at a price much lower than they could be bought new. This is especially true of a car which is out of the market as far as the manufacturer is concerned, and is considered an orphan car. To obtain new parts for a car of this type it is often necessary to either depend on an orphan parts manufacturer or to have the parts made at a near-by machine shop. Either course is somewhat expensive, as it costs more to make a single part than it does to produce the same part in quantity lots. As a rule such parts can be found at Setchell's and the price is normal.

Large Engine Stock.

The engine stock is unusually large and contains engines of every description, all of which are in running condition and ready to be installed.

Foundries in the city purchase the unsalable material and use it with pig iron in the blast furnace for making different grades of iron and steel castings. The quantity of junk varies from day to day as this material is drawn away or broken parts are added.

The used parts business, while of recent origin, is usually operated on a small scale and in more or less of a hit or miss manner, the proprietor operating his place of business much as he would a small store without any definite system of keeping track of stock. That his business does not grow as it should and is frequently in disrepute is mainly due to his faulty methods of merchandising. The Setchell Auto Parts Co. has proven in a striking manner that the demand for used parts is well defined and that this particular branch of the junk business may be easily raised to the dignity of any other retail industry. This company has employed no unusual business principles, neither has it made any unique effort to get business. It hasn't needed to do this. Good straightforward integrity coupled with honesty of purpose and a disposition to give the purchaser a fair deal has built this mammoth business and equal efforts on the part of others who follow along the same paths should have as good results regardless of where the establishment may be located.



Sorting Out Engine Blocks—The Two Repair Men Shown in the Picture Will Completely Rebuild These Engines.

THE EARL CAR



This Beautiful Closed Model Illustrates in Striking Manner the Rare Design and Workmanship Which Is Characteristic of the Industry's Latest Offering.

Company Recently Formed by Clarence A. Earl Already in Production on New Line of Medium-Priced Automobiles.

THE new Earl car embodies the very latest points in engineering design, and the material which enters into its production is stated to be the very best that can be procured.

All models are mounted on a 112-inch wheelbase chassis of conventional design, yet there are several distinctive features which heretofore are claimed to be found only in cars rated in the high-priced class. The frame is the single-drop type with side bars seven inches deep, and it is braced with five strong cross members and two large gussets. The rear springs are 56 inches long and the front 36 inches, all semi-elliptic. The front wheels are mounted on Timken roller bearings and the front axle is of the drop I beam type. The engine is an "Earl," four-cylinder, L-head type, with removable head. The bore is $3 \frac{7}{16}$ inches and the stroke $5 \frac{1}{4}$, giving it an S. A. E. rating of $18 \frac{9}{10}$ horsepower, but the actual developed horsepower is claimed to be $37 \frac{1}{2}$.

THE unusually heavy crank shaft, which is in dynamic balance, is supported in three bronze-backed, babbitt-lined bearings. The crank shaft thrust is taken up as a center main bearing. The timing gears are of the spiral type, one inch wide and, while the crank shaft and generator gears are made of steel, the cam shaft gear has "fabroil" teeth with a cast iron center, to insure quiet gear action. The compression ratio is 23 per cent. The lubrication is of the low-pressure force feed and splash type. The oil is forced through a plunger pump, operated by the cam shaft, directly

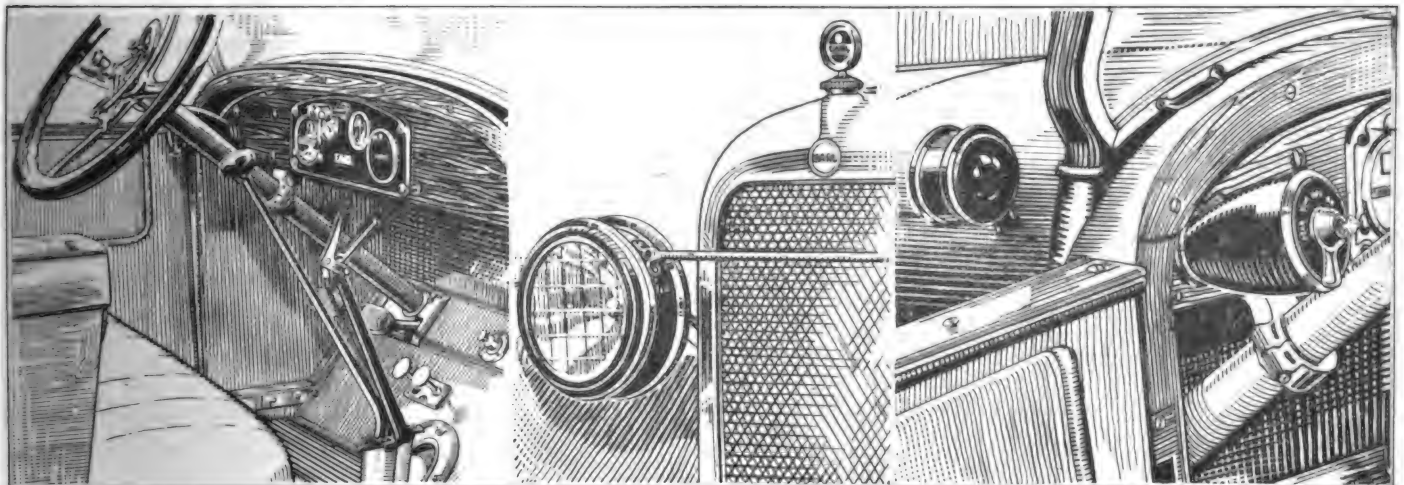
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to the oil pockets over the three main bearings and connecting rod troughs, and the connecting rods themselves, as well

as the cylinders, cam shaft bearings, cams and valves are lubricated by splash. The pressure oil gauge on the dash indicates a working pressure from two to four pounds. The carburetor is a one-inch Scoe model, with a variable venturi. The venturi opening in this carburetor adjusts itself automatically to the load requirements of the motor, thereby maintaining a constant air velocity at all motor speeds. This feature makes it very flexible and economical. The two-unit Auto-Lite starting and lighting system is used in connection with Connecticut battery

(Continued on Page 19.)



Features of Earl Car—Left, Showing Dash Control Units with Gear Shift and Emergency Brake in Center, Spark and Throttle Conveniently Located on Top of Steering Wheel; Center, New Style Radiator and Rolls-Royce Type Head Light; Right, New Style Locking Ignition Switch and Side Lamp.

Electrical Tips for Motorists

SYSTEMATIC SEARCH FOLLOWING PROCESS OF ELIMINATION
SOON REVEALS DEFECT—LEAST SUSPECTED PARTS OFTEN
AT FAULT—STUDY OF WIRING DIAGRAM ALSO HELPS.

(By WILLIAM DEVLIN.)

HOW often one notices motorists and drivers of motor trucks stopped along the road, because of some minor electrical trouble, trying to straighten out the difficulty so that the cars can again be put into operation! These electrical problems cause more bother to car drivers and truck operators than any other class of mechanical defects for the simple reason that they are the least understood and often, when repairs or adjustments are attempted, the trouble is made worse instead of rectified. Many owners have no idea of the function of the battery, wires, switches and other components of the electrical system and are at a loss to know just how to proceed to locate and remedy these defects. In tracing electrical troubles the start should be made at the storage battery, as this is the source of the electrical current for operating the various units.

THE battery is kept charged by the generator, to be sure, but current is drawn from the battery for the operation of the starting motor, lights, horn, ignition and other smaller auxiliary units.

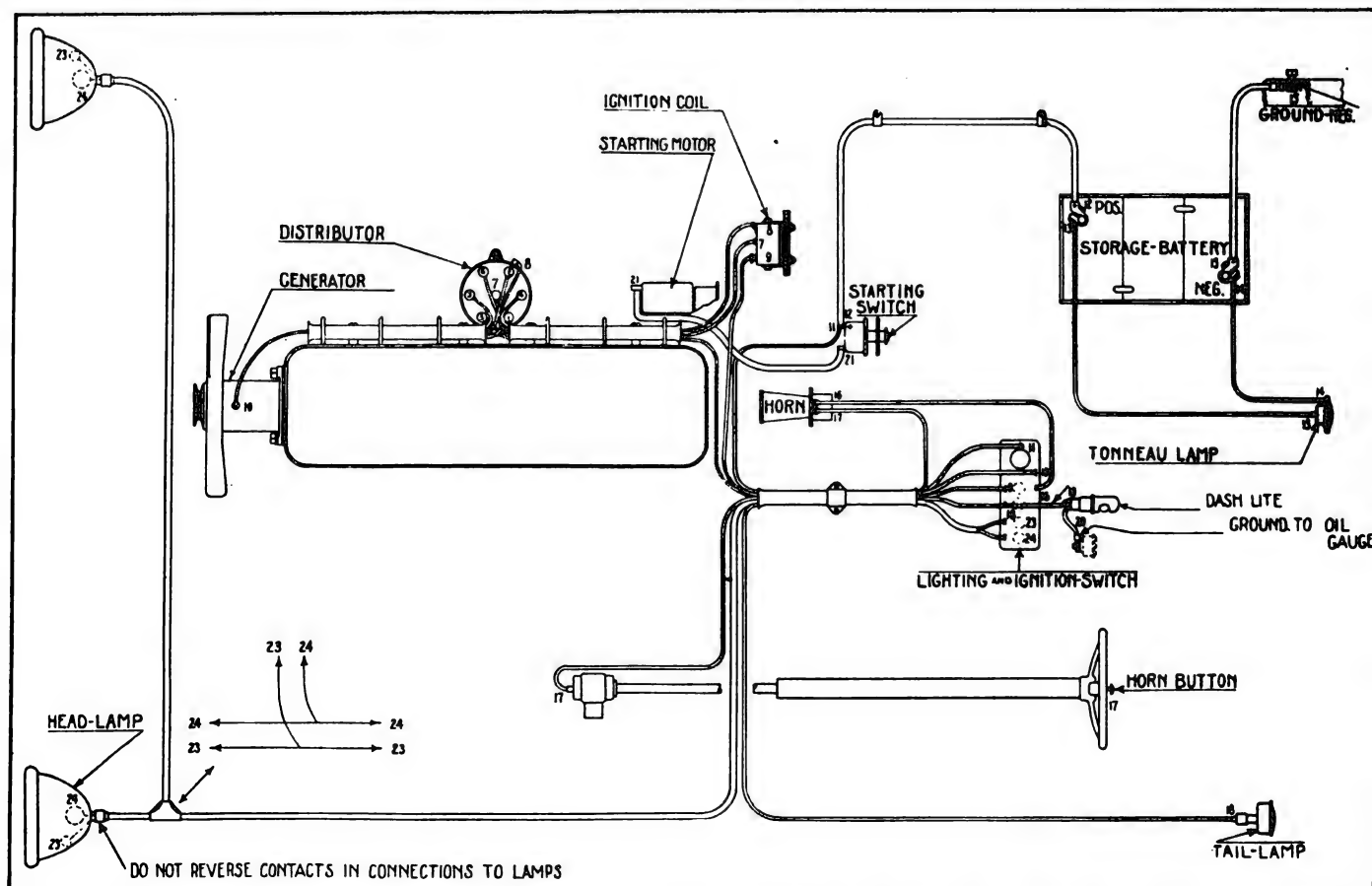
The battery is fitted with two end posts, marked respectively positive (Pos.) and negative (Neg.). Large terminal wires are connected to the posts by clamps which take the current from the battery on the positive side and return it to the negative side after it has performed its work at the starting motor. These connections may become loose, coated with verdigris

or corrosion, which will prevent the passage of the current only in small amounts. In this instance the lights will burn dim when turned on, the starting motor will turn over slowly and, if the condition is too far advanced, the motor may not turn.

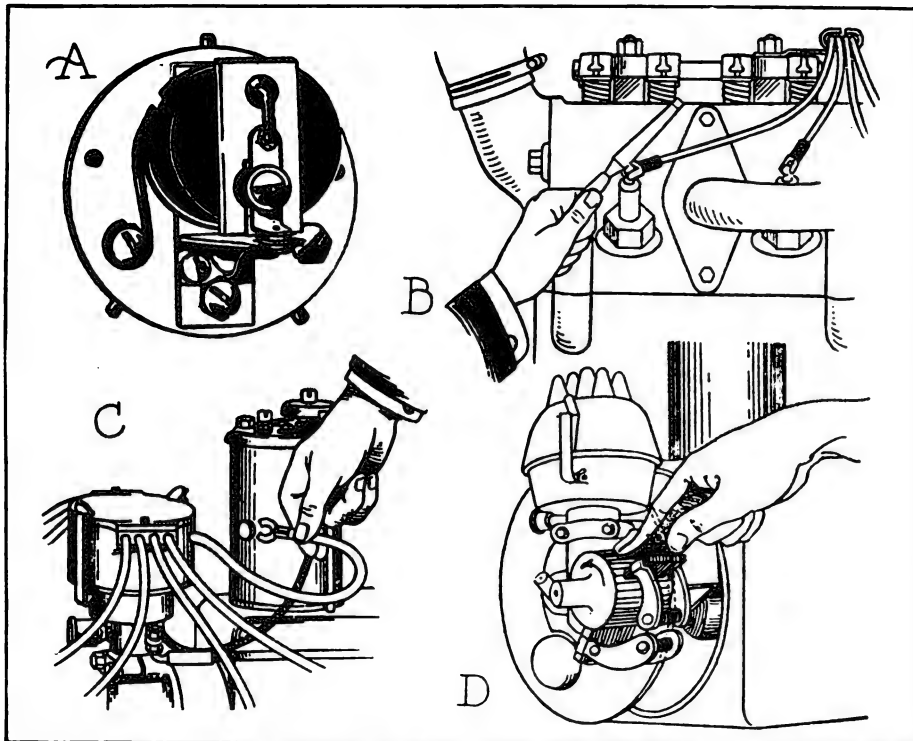
The terminal wires and clamps should be separated, if corroded, cleaned with fine sandpaper and the surfaces and interior of the binding clamps coated with vaseline to prevent a recurrence of the trouble.

The large terminal wires lead from the battery to the starting motor, completing the circuit through the starting motor button and in some cars the second wire

is dispensed with entirely, the current returning to the battery through the side frame of the car. This latter type of circuit is termed a grounded circuit because the motor is grounded to the frame, as is also one of the battery terminals. Some manufacturers ground the negative side, while others ground the positive. Whichever way the manufacturer connects the battery the same method should be followed if the battery is removed and later replaced, otherwise difficulty will be found in operating the car. For instance, the ammeter will read inversely and the starting motor will have a tendency to run in the opposite direction.



Typical Wiring Diagram of Modern Automobile—Wire Terminals Indicated by Numbers at Each Unit—Troubles Easily Traced by Following Colored Wires or by Checking Corresponding Numbers.



A, Rear View of Circuit Breaker; B, Short-Circuiting Spark Plug to Detect Missing Spark; C, Testing Spark at Ignition Coil (Lazy Coil Often Awakened by This Method); D, Sanding Commutator of Generator or Motor to Remove Grease or Scale.

Chafed wires or loose connections at the battery, starting switch, motor or ground connections will cause the motor to fail to operate properly and, if found, should be tightened or repaired.

Lighting, Horn and Ignition Circuits.

In practically all motor vehicles which use electrically operated lights, horn and battery ignition, a wire is led from either the storage battery, if a starting motor is not used, and from the rear of the starting button if a starter is used, which takes the current from the battery through the ammeter to the lighting and ignition switch. The ammeter indicates the amount of current which the units are drawing from the battery on the discharge side and keeps a check on the battery. Loose connections at this instrument will prevent the instrument from functioning properly and should be remedied. Reversing the ammeter connections will cause the ammeter to read incorrectly. This occurs occasionally if ammeter replacement has been necessary. The ammeter should have the connections reversed at the first opportunity so that it will read correctly. If, when the engine is stopped with the lights and ignition turned off, the ammeter still registers discharge, this is an indication that there is a short circuit in some of the circuits beyond the ammeter that should be remedied, as the constant drain on the storage battery, although small, will eventually run the battery down if allowed to continue.

Lighting and Ignition Switch.

The current, after leaving the ammeter, is carried by connecting wire to the switch which controls the lighting and ignition circuits. Loose connections at either place will weaken the current flow, preventing full function of the units. Testing the end of the wire at the switch by short-circuiting the current to the

metal part of the car will quickly determine if the current reaches this unit. If it does, the defect is probably in one of the circuits beyond the switch and should be determined by systematic search. Taking the circuits one at a time they may be traced through to the unit which they operate and the trouble located. Starting with the head light circuit, throw the switch to "on" and note if the lights burn properly. If they do, try the dimmer circuit in the same manner. As the dash and tail lights are on either circuit, they should be examined at the same time to see if they burn properly. If it is found that either circuit does not burn, or that the head lights burn and the dash or tail

light does not, look for the defect in that circuit which is giving trouble.

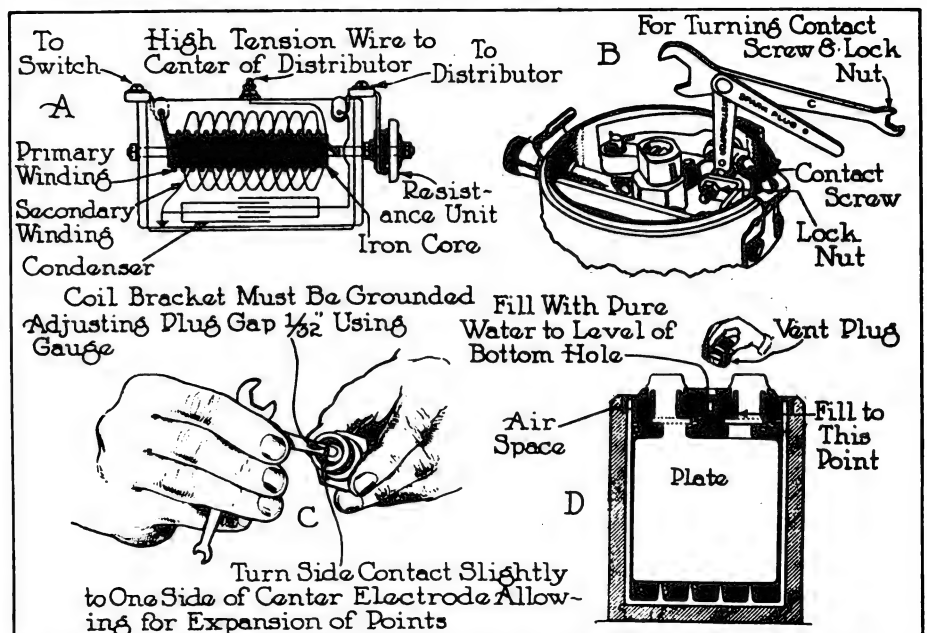
To illustrate the procedure, take the head light "bright" circuit, which connects the large bulbs in that circuit. Examine the bulbs first to make sure that they are not burned out, or that they are not making contact with the sockets. Often it will be found that one or the other of these troubles will be present. Replacing with a new bulb or making better contact with the socket connector will remedy the defect.

Fuse Panel and Fuses.

If the light bulbs are all right and all lights on that circuit fail to burn, the trouble is in the fuse panel. A fuse is probably burned out, causing an open circuit. There is a cause for the burned out fuse and diligent search should be made to discover it before putting in a new one. It may be occasioned by crossed wires, a chafed wire resting on the metal parts of the car or a small wire connection in the lamp socket, which causes a short circuit. Often in making connections at the lamp sockets a strand of wire projects to one side and is overlooked; this wire, coming in contact with the lamp socket, causes a short, which will blow the fuse.

Having located the short and repaired it, replace the fuse and test the circuit. If the fuse holds the trouble is found and the circuit will give no further trouble. If it blows, search must be made for further leakage and it is not safe to replace with another fuse until the short is located and remedied.

The same rule applies to cars equipped with a circuit breaker instead of fuses. This instrument is placed behind the instrument board and gives warning of short circuits by a buzzing sound. When heard the operator should immediately look for the trouble and remedy it if possible. It is more difficult to locate defects where the circuit breaker is used than it is when individual fuses are employed, as the circuit breaker controls all of the circuits while the fuse usually controls only one.



A, Sectional View of Ignition Coil Indicating Parts of Unit; B, Showing Method of Adjusting Breaker Points in Breaker Box; C, Setting Spark Plug Points with Gauge Tool; D, Sectional View of Storage Battery Showing Relation of Parts.

Rear and dash lights are usually wired in multiple in the same manner as commercial house lights, and if one burns out the other does not, but will continue to burn. Lights of this type are six-volt, two-candlepower and draw but very little current from the battery.

One or two manufacturers wire these lights in series, splitting the circuit voltage, placing two three-volt, two-candlepower lamps in a six-volt circuit. The object of this is that, when the rear light goes out through accident or natural causes, the fact will be shown by the dash light going out also. Replacing the burned-out or damaged light will remedy this defect.

The use of parking lights, cigar lighters and other auxiliary circuits adds additional circuits to the car wiring, which are tapped into the main circuit back of the lighting and ignition switches so that they are not controlled by either switch, but a separate one either in the light itself or on the dash panel. Defects in these circuits may be located in a man-

ner similar to that described for lighting circuits and will usually be found to consist of short circuits, burned-out bulbs, loose connections and the like.

Ignition and Horn Circuits.

The same rule for tracing defects in the ignition and horn circuits applies as for tracing defects or shorts in the lighting circuits, except that the horn circuit is tapped in back of the lighting and ignition switch and is controlled by the horn button with a fuse in circuit. A blown fuse will put the horn out of business and will usually be caused by a short circuit. Poor or loose connections at the horn button or horn will weaken the tone, while defects in the horn will prevent it from operating. If of the buzzer type, the contacts may need adjusting or cleaning. If of the motor driven type the horn may need oiling, cleaning or brush adjustment.

The ignition circuit supplies the ignition current to the spark plugs through coil, breaker box and distributor. Defects in this circuit which prevent the engine from operating may be caused by a

short circuit due to frayed wires, loose connections, failure of the breaker points to operate properly, burnt-out coil, dirt or oil in the distributor head.

Testing the current flow at the breaker box will determine whether it reaches this point; while watching the breaker points operate will show whether they are opening and closing properly. A punctured condenser will not cause the engine to stop, but will make the breaker points arc and requires replacement to restore it to efficiency.

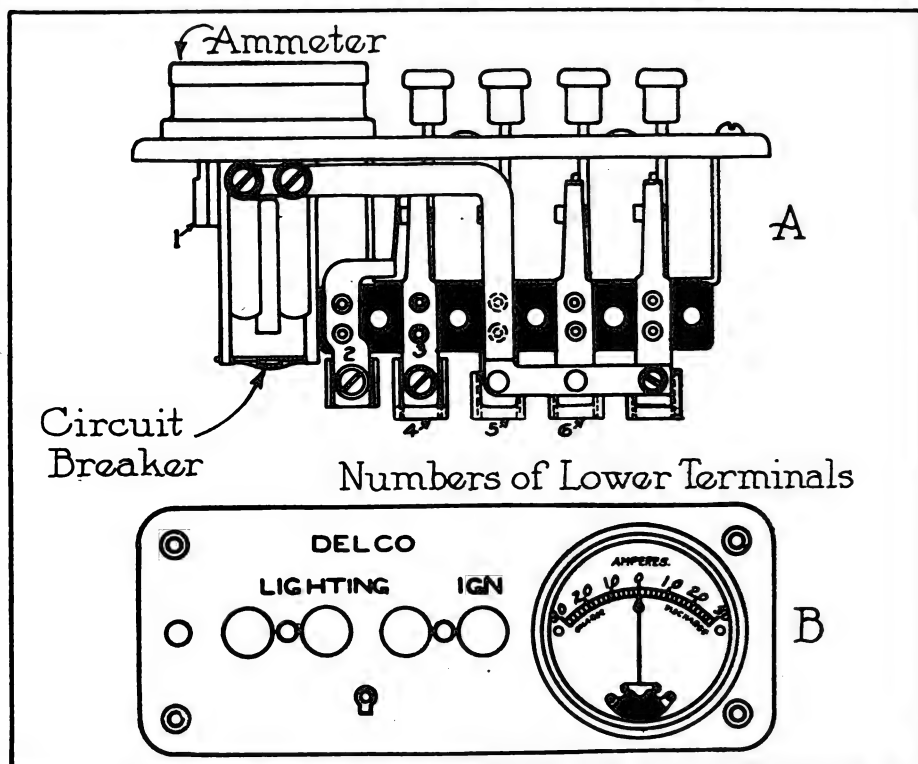
Burned points in the breaker box will cause the engine to start hard and to run irregularly. Replacing the burned points with new will remedy this defect.

A burned-out coil makes itself manifest by the engine stopping and when turned by hand not giving a spark at the high-tension lead at the side of the coil when the lead is separated about 1/16 inch. Sometimes separating the high-tension wire in this manner will "wake up" an otherwise "dead" coil and the engine will run while warm, but will stop again when cold. The spark gap at the coil intensifies the spark and allows the plugs to give a heavier spark than they otherwise would.

Spark plug troubles often occur when least expected and are baffling for the novice to locate. They are, however, easily detected by shorting the plugs with a screw driver and noting which cylinders are firing. Those that are firing will stop when shorted and will cause the engine to run unevenly.

Removing the plug from the cylinder that is not firing will usually show that the porcelain of the plug is cracked, that the plug is filled with oily carbon deposits, or that the plug gap is too great or too small.

The carbon deposit should be scraped out with a pen knife and the points adjusted to about 1/32 of an inch or the thickness of a worn dime. Lay the plug on top of the cylinder after connecting the high-tension terminal wire, and try the plug with the engine running. If a good spark is shown, the plug is all right to put back into the cylinder; if not and sparks seem to jump across inside without coming to the points, the porcelain is cracked, allowing the current to leak. The plug should then be discarded and replaced with a new one or one that is known to be sound.



A, Side View of Delco Switch, Showing Connections; B, Front of Delco Lighting and Ignition Switch, Showing Position of Ammeter.

NAILS AND TACKS.

Frequently when tires are examined it will be found that the cause of a mysterious puncture is a tack or nail point on the inside of the shoe which has penetrated the tube. On pulling out the nail or tack with pliers it is often seen that the tack or nail has been in the casing for a long period and that the head is worn off. After removing the nail or tack the hole in the casing should be filled with plastic rubber compound to prevent water entering and rotting the fabric of the tire.

Such nails may not be noticed on a casual examination of the outside of the tire as, the head being worn off, the rubber tread quickly covers it, and its pres-

ence is not known till the puncture occurs. Often, however, nails and tacks can be located by pressing the tire on the outside with the thumb and finger. Soft spots will show that the fabric is weak and further pressing of the tire will often expose the nail or tack.

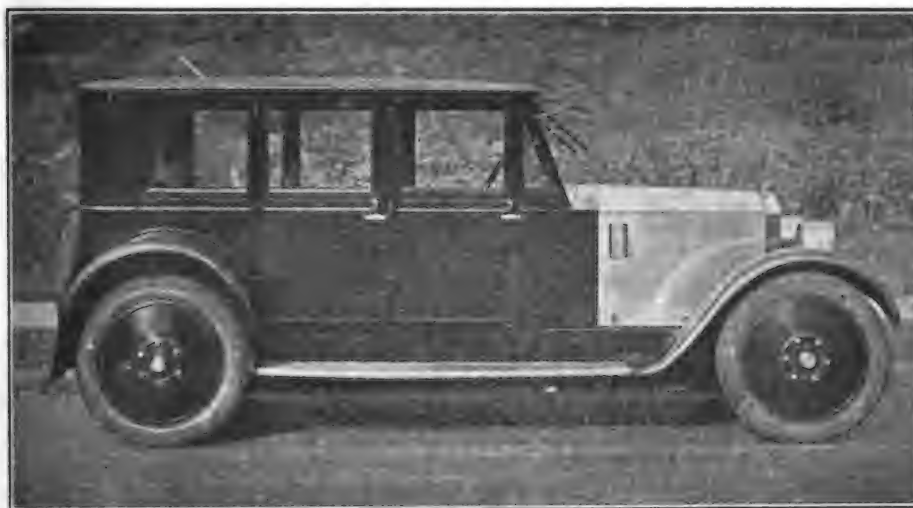
SAVE VALVE CAPS.

Don't throw away valve caps. Screw them on firmly and prevent air leakage. The valve plunger, a little mechanism inside of the stem, serves as an air lock during inflation, but the valve cap is the secondary air seal during usage. Tire men advise employing the valve to inflate the tire and using the cap to keep it inflated.

REMOVING HUB WASHER.

The job of removing the wheel hub washer seems often an almost impossible job, but it can be made easy by the use of a simple tool that is readily made by any car owner. Take a pair of round-jawed pliers five or six inches long. File a notch on the inside of each jaw near the end and then reduce the diameter of the jaws until they will just slip into the holes in the ends of the split washer. With this tool it is a simple matter to remove the washer. Just hook the ends of the pliers into the holes, close the pliers to contract the washer and withdraw it from the groove, when it may be slipped out by running the point of a screw driver around the edge.

This Well
Designed
Motor Car
Is Said
to Meet
with the
Approval



of the
Discriminating
Purchaser.
Extreme
Power and
Light Weight
Are Features.

A Car For the Critical

*Many Units of Fergus Car Made in Company's Own
Factory—Engine Is Extremely Flexible and Silent in
Operation—Develops 80 Horsepower.*

FERGUS cars, manufactured by the Fergus Motors of America, Inc., 370 Jelliff avenue, Newark, N. J., are considered among those qualified to pass judgment as distinctive for the critical purchaser who wishes the best. Similar to other cars which sell at a high figure, many of the chassis units, such as the engine, front and rear axles, are made in the company's own factory, receiving careful supervision during the course of manufacture which enables its engineers to guarantee performance in the hands of owners. The Fergus engine, a six-cylinder, L-head type, is extremely flexible and silent in operation. The bore and stroke is $3\frac{3}{4}$ by five inches, it has a piston displacement of 249 cubic inches, is rated under the N. A. C. C. standard at 25.35 horsepower, but actually develops 80 horsepower at 3000 revolutions a minute. A high rate of horsepower in proportion to the chassis weight is obtained—approximately 28 pounds at brake horsepower.

The seven journal crankshaft is balanced statically and dynamically to remove all possibilities of vibration affecting the engine operation, while all reciprocating parts are extremely light.

THE valve mechanism is located overhead and is driven by overhead cam shafts, this method of engine assembly, it is claimed, enabling speeds around 4000 revolutions a minute without injury to the power plant.

Lubrication of the engine is by pressure from a pump located in the engine sump, taking oil through a metal screen, which prevents the entrance of sediment from the oil reservoir, a feature which is very important in pressure lubricated engines, especially if the oil is forced through a drilled crank shaft to the main journals and connecting rod bearings.

Cooling is accomplished by a large capacity honeycomb radiator located in the conventional position, while a four-bladed aeroplane fan at the top of the engine cylinders, driven by gears from the timing gear set, provides positive air circulation through the radiator core for cooling the water. A centrifugal water pump, also driven from the timing gear set, provides water circulation through the radiator and the unusually large water jackets surrounding the engine cylinders, valves and plugs.

Gasoline is fed by vacuum to the Stromberg carburetor, a special shaped

intake manifold conducting the mixture to the engine cylinder combustion chambers. Delco ignition is standard equipment for this car, while Bijur starting and lighting are furnished regularly.

Chassis Components Well Chosen.

The clutch, a multiple, dry-disc type, is mounted in the face of the fly wheel, enclosed in the fly wheel housing adjoining the transmission which is also in a unit with the power plant. The Fergus rear axle is of the semi-floating type, using spiral bevel gears to transmit the power of the engine, through the differential, to the axles and wheels, while the final drive is through torque arms which prevent the axle from turning over, enabling the springs to care for spring action alone. The final gear ratio is four to one. The rear and front axles are mounted on ball bearings of high-grade quality. Ball bearings are used in the transmission on the main shaft ends, while plain bearings are used for the counter shaft.

The frame is suspended on cantilever springs, the front and rear springs being encased in oil-proof leather covers to prevent the entrance of road dust and to supply sufficient spring lubrication to the leaves.

The wheelbase is given as 126 inches and the size of tires used as 33 by $4\frac{1}{2}$ inches front and rear, straight side cords. The weight of the touring car is 2500 pounds complete ready for the road and the price of the five-passenger touring car is around \$10,000.

A very low center of gravity is obtained in the Fergus Series Five car, the distance from the ground to the floor of the car being approximately 21 inches, this being gained without sacrificing clearance.

All slow-moving bearings of the chassis are lubricated automatically, so that there is little likelihood of their running without sufficient lubrication.

All control parts of the Fergus car, including the steering, changing speeds, operation of brakes and other controls, it is stated, function very easily and are not tiring to the driver. It is possible to obtain practically 20 miles to the gallon of gasoline, which is considered very high for a car equipped with an engine of this extreme power, the light weight of the units, it is claimed, making this a possibility. Front wheel brakes may be supplied at extra cost when required.

Steal 83 Automobiles A Day

Figures from 28 Cities Show Staggering Theft Total—Although Number Is Smaller Than During Previous Year, Says National Automobile Body.

(By HARRY G. MOOCK, General Manager, N. A. D. A.)

THIRTY THOUSAND AND FORTY-SIX automobiles were stolen last year in 28 "index" cities of the country and 21,273 of them recovered, according to the annual compilation of the National Automobile Dealers' association, with headquarters in St. Louis, Mo. The number stolen was 3012 less than in 1919, but was 2601 more than the number stolen in 1918. In 1918 cars unrecovered were 21 per cent. of the number stolen; in 1919 they were 26 per cent. and in 1920, 29 per cent.

Chicago took the lead from New York with the number stolen, although a higher percentage of cars remained unrecovered in New York. New York had 5179 stolen; Chicago, 5527. New York recovered only 2717 of her stolen cars, while Chicago recovered 4340. Dayton, O., had the unusual record of having recovered more cars than she had stolen.

PACIFIC coast cities kept up their yearly good work of recovery. There were 4877 cars stolen in Los Angeles, San Francisco, Oakland, Portland and Seattle, and 4175 recovered. The unrecovered cars were 16.4 per cent. of the total stolen, or approximately 50 per cent. of the average for the country.

The figures compiled from official sources for the 28 cities for which the N. A. D. A. has three-year statistics, are shown on this page.

As is shown by this compilation the number of thefts in these cities decreased in 1919-1920 about 10 per cent., while the general increase in the number of automobiles throughout the country was about 20 per cent. during the same period. The decrease in the number of thefts therefore is materially greater than would be indicated by the percentages. A considerable part of this decrease is attributed by the N. A. D. A. to the deterring effect of the National Motor Vehicle Theft law (the Dyer law), which was put through Congress at the instance of the N. A. D. A., and by more stringent laws in the states for the punishment of motor car thieves.

However, a good part of the better showing is due also to vigorous activity of the peace authorities, such as in Buffalo, where Chief of Police Higgins, known as the "youngest police chief in the United States" is making a determined drive against the automobile thieves, and in St. Louis where the office of the circuit attorney, cooperating with the police department, has virtually put

the professional automobile thieves in the state penitentiary; most of them convicted there received long terms and it is expected that

vigorously by the N. A. D. A. because of the theft insurance rates now having become so high as to prove a big factor in the resistance to the sales of automobiles.

AUTOMOBILE THEFT RECORDS.

| | STOLEN | | | RECOVERED | | |
|---------------------|--------|--------|--------|-----------|--------|--------|
| | 1918 | 1919 | 1920 | 1918 | 1919 | 1920 |
| New York | 3,340 | 5,527 | 5,179 | 2,578 | 3,124 | 2,717 |
| Chicago | 2,611 | 4,447 | 5,974 | 1,954 | 3,447 | 4,340 |
| Detroit | 2,639 | 3,481 | 3,300 | 1,934 | 2,529 | 2,563 |
| Cleveland | 2,076 | 2,338 | 2,649 | 1,816 | 1,786 | 1,765 |
| Los Angeles | 1,629 | 1,688 | 1,654 | 1,499 | 1,365 | 1,152 |
| Kansas City | 1,144 | 1,661 | 801 | 606 | 794 | 341 |
| Portland, Ore. | 1,088 | 1,528 | 465 | 990 | 1,378 | 418 |
| Denver | 901 | 1,440 | 858 | 627 | 1,187 | 661 |
| San Francisco | 1,122 | 1,354 | 1,186 | 1,082 | 1,304 | 1,156 |
| St. Louis | 2,241 | 1,241 | 788 | 1,354 | 944 | 641 |
| Seattle | 1,451 | 1,422 | 1,008 | 1,376 | 1,398 | 909 |
| Indianapolis | 404 | 1,031 | 1,152 | 334 | 692 | 833 |
| Boston | 866 | 1,002 | 480 | 607 | 580 | 297 |
| Salt Lake City | 797 | 776 | 592 | 790 | 758 | 553 |
| Oakland, Cal. | 895 | 760 | 564 | 860 | 733 | 549 |
| Omaha, Neb. | 1,039 | 734 | 634 | 669 | 567 | 507 |
| Columbus, O. | 451 | 559 | 513 | 352 | 373 | 278 |
| Cincinnati, O. | 348 | 520 | 525 | 291 | 293 | 273 |
| Oklahoma City | 571 | 149 | 205 | 484 | 70 | 133 |
| Albany, N. Y. | 41 | 133 | 87 | 29 | 104 | 70 |
| Buffalo, N. Y. | 1,262 | 986 | 743 | 914 | 700 | 507 |
| Newport, R. I. | 4 | 9 | 12 | 4 | 9 | 12 |
| York, Pa. | 6 | 10 | 8 | 6 | 9 | 8 |
| Grand Rapids, Mich. | 152 | 189 | 262 | 149 | 137 | 250 |
| Richmond, Va. | 84 | 207 | 148 | 62 | 161 | 93 |
| Dayton, O. | 207 | 228 | 198 | 241 | 213 | 217 |
| Lowell, Mass. | 26 | 25 | 14 | 16 | 17 | 7 |
| Evansville, Ind. | 50 | 72 | 43 | 49 | 68 | 40 |
| Totals | 27,445 | 33,508 | 30,046 | 21,673 | 24,740 | 21,273 |

1918, 5772—21% of number stolen.
1919, 8768—26% of number stolen.
1920, 8772—29% of number stolen.

thefts in St. Louis will show a steady decrease from now on.

The subject of theft is being watched

It is realized that until thefts are materially checked little progress can be made in the matter of insurance reductions.

NOISY VALVES.

Noisy valves may be effectively silenced by the installation of a valve adjuster and silencer. This device makes possible a firm but flexible valve adjustment under all conditions. Many of these devices are shown from time to time by advertisers in the New Accessory columns of the Accessory and Garage Journal, and greatly assist in keeping the valve mechanism quiet, especially the valves of overhead or I-engines.

The valve mechanism of L-head engines is as a rule enclosed on cars of late date, oil in the form of mist or fog supplying sufficient lubricant for them to perform properly, while the plates enclosing the mechanism prevent the oil from wasting and obviate excessive noise.

TO SPEND \$3,500,000.

Contracts for new hard surfaced roads to a grand total of \$3,487,224 have been let in Kansas since Jan. 1 of this year.

DIM HEAD LIGHTS.

Did you ever wonder why your lights burned dim, even though you knew that your storage battery was fully charged and that the generator was generating properly? This is usually most noticeable when the car is standing with the engine not running. The reason is not hard to find when you examine the light and ignition wire connected to the storage battery. Corrosion at this point will inevitably cause weak lights.

Straight Eight-In-Row a Success

LAURELS ADDED TO DUESENBERG PRESTIGE THROUGH RACING EVENTS INDUCES INVENTOR TO MARKET PASSENGER CAR EQUIPPED WITH THIS POWERFUL ENGINE—PRODUCT LIMITED AT PRESENT.

THE new Duesenberg straight eight in a row engine having passed through the experimental stage is now offered to the public as a complete unit mounted in a specially designed chassis.



Overhead Valve Mechanism of Duesenberg Eight-in-Row Engine Successfully Operated by Overhead Cam Shaft Driven by Spiral Gears Through Vertical Shaft from Timing Gear Set.

In all, 66 world's records stand to the credit of this engine, all made within the short period of 2½ years time. The remarkable feature of this interesting power plant, admittedly one of the finest produced in this country, is that the piston displacement is only 183 cubic inches, within a few cubic inches of the displacement of the Ford engine, but developing, it is claimed, nearly five times as much power.

Soon after the armistice was signed the plant of the Duesenberg Motors Corporation was purchased by the John Willys interests. This situation gave Mr. Duesenberg the opportunity to carry out his life-long ambition of producing an automobile equipped with engine, axles and other parts which were the result of his 20 years of experimentation. A temporary plant was opened at Elizabeth, N. J., for the construction of racing engines and the first of the new Duesenberg passenger automobiles. It was in this plant that the eight-cylinder, 183 cubic inch engine was designed and constructed with the cylinders all in a row, which, because of its interest to the motoring public, is herein briefly described.

Engine Develops 90 to 100 Horsepower at 3000 Revolutions.

The Duesenberg engine is capable of speeds from three to 90 miles an hour in high gear, has a bore of 2½ inches and stroke of five inches and piston displacement of 260 cubic inches, as designed for passenger car service. The valves are

placed two per cylinder of ample diameter, giving the engine exceptional torque at high speeds.

The cylinder casting and upper half of the crank case are cast integral, with the cylinder head removable and containing all the valves and the cam shaft. The combustion chamber is bored out and polished to prevent carbon deposits, while the gears are so arranged that the timing cannot be changed or assembled wrong when the head is removed for cleaning or grinding valves.

The crank shaft is one piece mounted in 2½-inch main journal bearings, with two-inch connecting rod bearings. Oil is fed by pressure to all the bearings, the same as used on the present Duesenberg racing cars. The cam shaft is of one-piece hollow construction, drilled for oil feed to all bearings located in the head. The rocker arms are located on the engine head, also lubricated by pressure.

The connecting rods are machined all over, are of tubular type, extremely light and the lower end is arranged for cooling fins to prevent hot bearings at high speeds. The lower half of the crank case is aluminum and may be removed while the engine is in the chassis.

Unusual Accessibility Featured in New Design of Engine.

To show how far the feature of accessibility has been carried in designing the Duesenberg engine, the crank shaft may be removed while the engine is in the car without removing the cam shaft or valves, or in any way disturbing the adjustment of the valves. The engine is so arranged that the crank case can be mounted into the frame and every part mounted and assembled while in the

chassis, simplifying overhauling and making it possible to perform repair work easily on the road or in repair shops.

The spark plugs are set in the head at an angle to prevent fouling, are amply cooled and accessible. The engine is suspended by side arms from the standard S. A. E. bell housing directly to the main chassis frame, and is supported on the front end by a new patented trunnion, making the strongest, stiffest and lightest mounting possible with sufficient flexibility for road work.

The standard pistons are magnalite, but extremely light cast iron pistons are made and furnished if desired. Three piston rings are used and the piston, connecting rod and piston pin complete weigh a total of 32 ounces.

Lubrication is furnished to the engine by a special force pump located in the lower sump, which draws oil through a screen, supplying the engine bearings with clean oil at all times. The fly wheel is a steel forging.

Engine Said to Be Smooth Running at All Speeds.

The carburetor is same as used on the racing cars, only one being used for the eight cylinders. Claim is made that eight cylinder "straight in line" engines as built by Duesenberg have wonderful balance and smooth running at all speeds.

The engine is so designed that it will lend itself most favorably to light weight requirements having all the reciprocating parts extremely light, insuring smooth and noiseless operation.

The length of the engine cylinders overall is 30 inches and the weight of the engine complete, with transmission, is approximately 600 pounds.



Clean Cut Lines of Duesenberg Straight Eight-in-Row Engine Clearly Shows That Unnecessary Parts Have Been Eliminated and That Accessibility Has Not Been Overlooked in Its Design.



Tale of the One Wrench Garage

(By S. G. SWIFT.)

FRIEND of mine is a motor car enthusiast—also an expert repair man. He was always an automobile bug. That just came natural. The expert repair man part—well, that's another story, "a calf of a different color," as they say down Arkansas way.

Three years ago this man didn't know a spark plug from a right-hand accelerator, although he was then driving his third car. Seriously speaking he really knew a bit more than that, but he was one of those fastidious fellows who hated to so much as change a tire, and to my personal knowledge has more than once driven home on the rim rather than get mussed up by the labor of putting in a tube.

He was a charter member of that large class that furnishes the garage and repair shop with their means of subsistence. He spent a lot of money with them in the run of a year—spent it cheerfully, too. But he doesn't spend so much now. He does nearly all of his own work at the present writing. And, as I said in a previous paragraph, he's a mighty good repair man. Perhaps you are wondering—if you have read thus far—just how he became so well acquainted with the intricacies of his pet machine.

WELL, it's a short tale and easily told. It seems that he had a well known make of automobile which after two years' service was distinctly in need of a general adjustment. Nothing radically out about it—just a rattle or so, perhaps a few loose bolts and missing cotter pins. He took it around to the garage man who had always done his work and asked to have the job done as soon as conveniently possible, and was told to come in after the machine on the following day. Shortly after lunch the next afternoon he visited the repair shop and asked the man on the floor where the car was.

"Over in the annex," said the helper, and my friend bent his steps in that direction. Entering the somewhat dimly lighted shop that was used for the overflow from the main building, he found his car and two mechanics. Unobserved, he stood watching them for about five minutes. One of them, the proprietor of the place, was lying on his back under the machine. The other mechanic was lazily leaning against the car and there were two work tickets attached to the steering wheel.

"What's the idea of the two tickets?" asked my friend, stepping up to the indolent mechanic.

"Two of us working on the machine," he was told.

"What part of the job are you doing?" my friend wanted to know.

"I'm just starting in to tighten up the steering wheel adjustment," answered the other.

"Why don't you tighten it up then; in-

stead of standing around?" asked the car owner in his good-natured, inoffensive way.

"I will," answered the repair man, "just as soon as the boss gets through using the wrench."

"For the love-a-gawd," exclaimed my friend. "You fellows only got one wrench?"

"Well, no, I wouldn't say that," answered the mechanic, somewhat moodily. "Couple others kicking around, but this is the only decent one—rest is all worn out."

By this time the owner of the repair shop, hearing the conversation, had crawled out from under the car. He started to explain. But my friend waved him away.

"How much do I owe you?" he asked. The bill was made out in a deep silence, was paid, and the car owner started his car and then stood for a moment before the machine. Then he smiled in his characteristic way.

"So long," he said, as he threw her into first.

"Come in again," invited the shop owner, who seemed to think that the danger of a storm was passed.

"I will—NOT," said my friend, as he drove out of the garage.

A couple of weeks after the events narrated I happened to call with my wife on this friend. His wife met us at the door with a cordial welcome.

"Jim's out in the garage," she said, and I strolled to the back of the house which my wife entered with Jim's wife.

"Hey there," I shouted as I came with-

in hailing distance of the small cement structure.

"Come in," invited a voice in muffled tones. I did. A pair of very greasy over-alled legs met my vision.

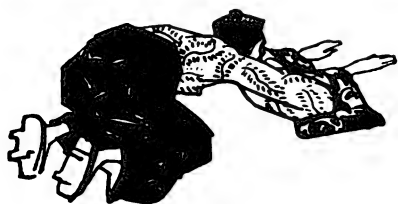
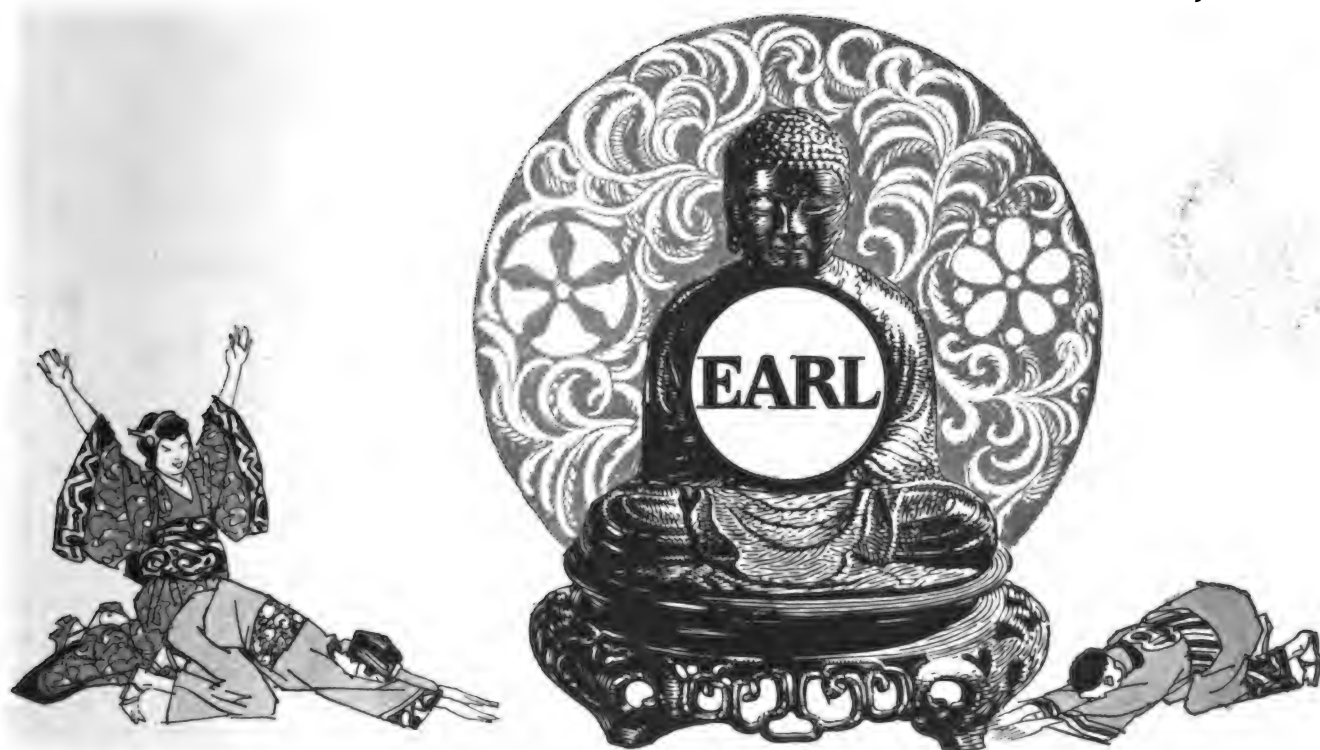
"I'm under the car," said a voice which proved to be Jim's. "Adjusting these darned connecting rod bearings," he explained.

"YOU adjusting them," I jeered. "Probably putting the finishing touches on what will be a wreck."

"Not to the extent you might think," he came back. "I'll take a chance with any mechanic you ever saw," he grunted. And when we were together he told me the story I have narrated.

"And I decided I wasn't going to pay anybody \$1.25 an hour to stand around and wait for a wrench; so I learned how to do my own repair work," he said in conclusion.

I happen to know the garage man who was responsible for his education. He is an honest, hard-working man and a very thorough workman. But my friend's grievance was probably legitimate. I believe that I should have felt as he did under the circumstances. There is no excuse for the repair man not having the proper tools and plenty of them. He owes it to his trade as well as to himself. Furthermore, despite the very old and perhaps frequently apt adage that "the good workman never quarrels with his tools," I, who am somewhat more than mechanically inclined, fail to see how anybody can do decent work without having proper equipment. I know because I have had expensive experience.



It's here!
The
EARL
MOTOR CAR

\$1285
F O B
Jackson, Mich.

Number Four

(When Writing to Advertisers, Please Mention the Automobile Journal.)



The EARL *Touring Car*

The picture tells the story. We are confident that the Earl car will receive a warm welcome at the hands of the public.

It's a high powered, four cylinder motor—long stroke.

The price \$1285 means big value to the owner and real profits to the aggressive dealer.

Built on present low costs of materials makes this reasonable low price possible. We had no war inventory to consider.

Dealer discounts have not been cut—they are figured on a fair basis so that you can make money.

Build for the future—get a permanent franchise.

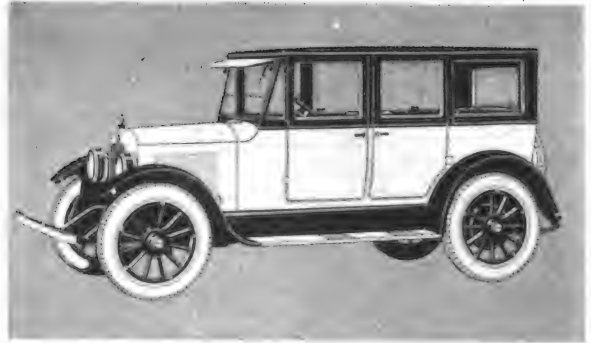
Our dealers are our partners and together we have built this car.

This line can't help but be profitable to the right dealer.

We want you to come to the factory and investigate our proposition while the opportunity is open.

The EARL Sedan

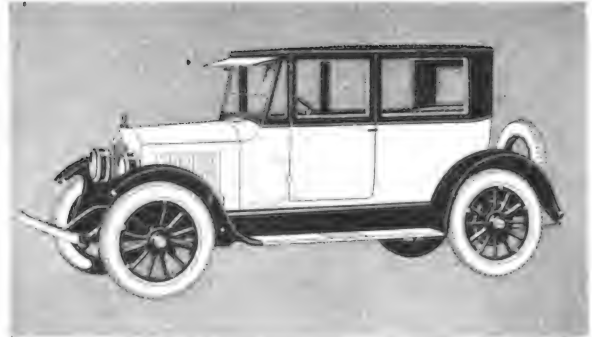
Good taste, convenience and comfort describes this graceful, distinguished Sedan. Every motor car owner will eventually drive a closed car. It's the all-year car for the entire family. Exclusive Earl type of lighting and starting switch. The same graceful lowness of line which distinguishes the Touring car obtains in this Sedan. Walnut instrument board—upholstered in the finest fabrics. Platinum silver finish is the hardware, rear mirror, windshield wiper, heater, running board mats, cowl ventilator, moto-meter, front spring, bumper, pillar lock, electric light under the hood, trouble light. Non-skid cord tires all around.



Sedan, \$1995, F. O. B. Jackson.

The EARL Brougham

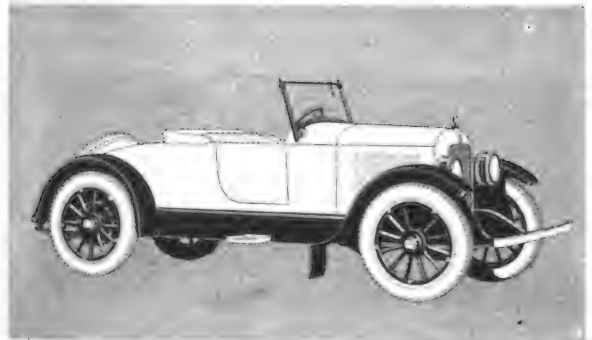
Long distances in this Brougham will not weary you. The ease with which it handles will make a very powerful appeal to physicians, to business men, to their wives, and indeed, everyone who is seeking a vehicle of convenience and distinction and to whom mere passenger capacity is of secondary importance. Full four-passenger. Platinum silver finish hardware, rear mirror, windshield wiper, heater, running board mats, cowl ventilator, moto-meter, front spring, bumper, pillar lock, electric light under the hood, trouble light. Non-skid cord tires all around.



Brougham, \$1995, F. O. B. Jackson.

The EARL Roadster

Here is a high powered, custom-built Roadster painted in a variety of attractive colors with all the refinements and conveniences for the young man and the young woman who still have a full life to live. Conservative enough for the middle-aged gentleman who doesn't like crowds. It will sparkle in your show room. It will make people turn on their heel as it passes on the boulevard. It will be admired wherever it is seen. It will advertise the entire Earl line. Contrary to general practice, it lists for slightly more than the Touring car, but remember it is "custom-built."



Roadster, \$1375, F. O. B. Jackson.

The EARL Delivery PANEL

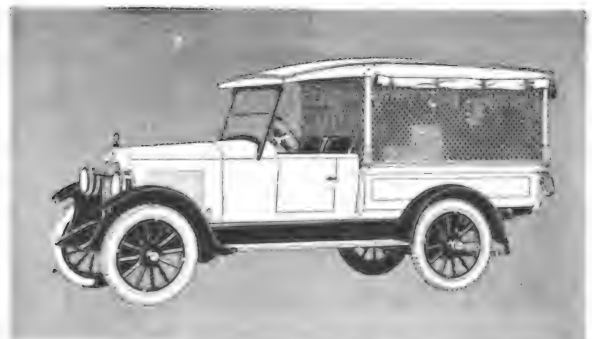
Like the screen job it has a seven-inch channeled steel frame. It has a straight line drive direct from motor to rear axle through a special fabric universal joint. This prevents whipping or breakage of the driveshaft, even under exceptional strain. Inside width 44 inches; inside height 50 inches; inside length 73 inches; height from floor boards to ground 30 inches; extreme width of roof 49 inches; extreme length of roof 112½ inches; weight front 1180, rear 1340, total 2520 with gas, oil, water and spare tire. Over-all dimensions, length 172 inches; width 64 inches; height 82 inches.



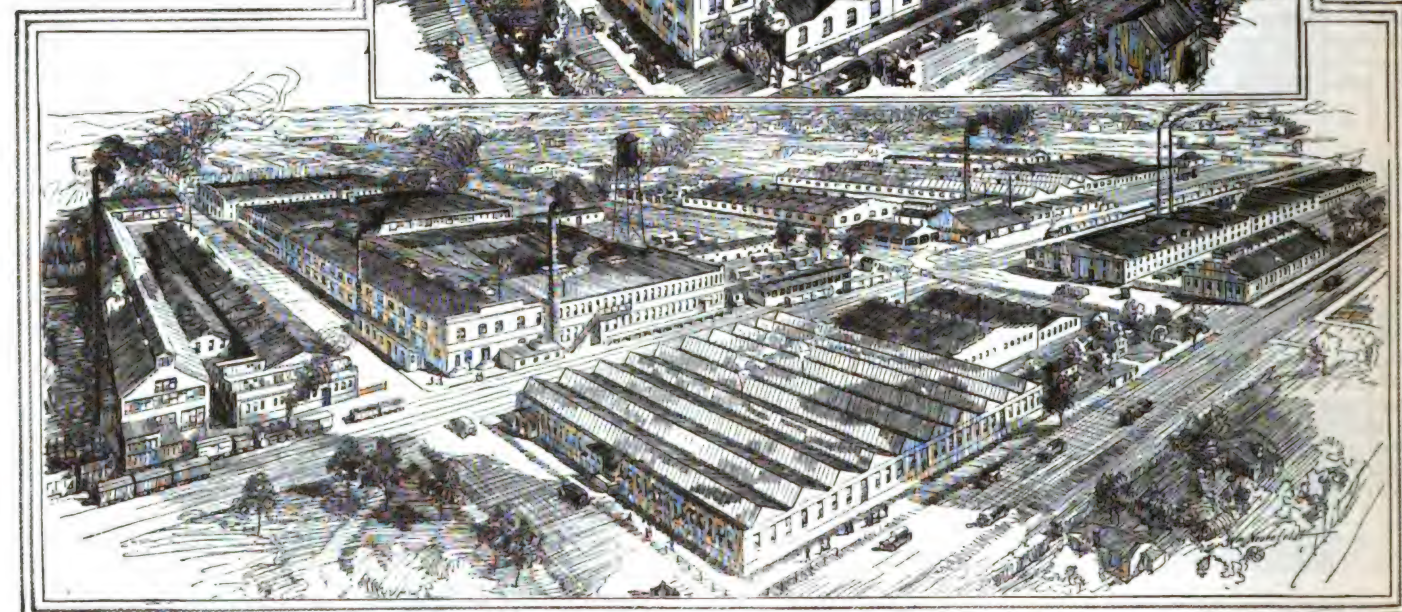
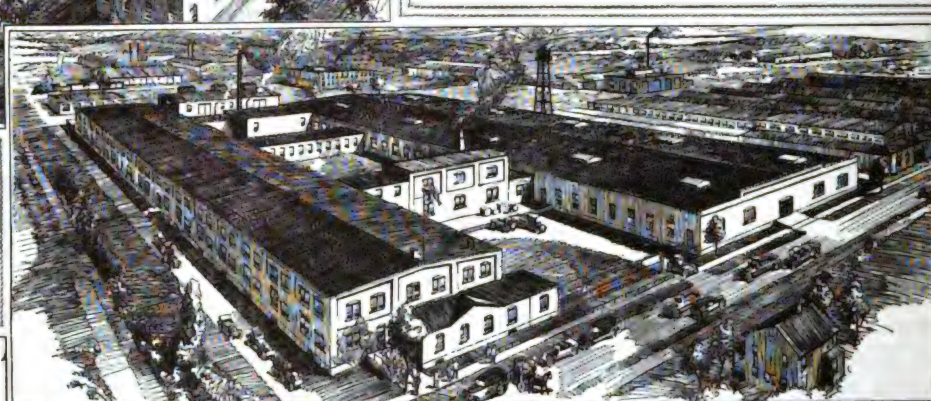
Panel Delivery, \$1160, F. O. B. Jackson.

The EARL Delivery SCREEN

The screen or open body, with thief-proof steel netting all around, is standard. Inside width 43¾ inches; inside length 73 inches; width of flare boards inside of posts 52 inches; height from floor boards to top of tail gate 12 inches; height from floor boards to top of flare boards 15 inches; height from floor boards to inside of highest point of roof 49 inches; width of roof 59¾ inches; length of roof 104½ inches (not including moulding), width between top posts 52 inches; weight front 1180, rear 1310, total 2490 with gas, oil, water and spare tire.



Screen Delivery, \$1085, F. O. B. Jackson.



The EARL FACTORIES JACKSON MICHIGAN

SUMMARY OF SPECIFICATIONS EARL MODEL 4-40

| | | | |
|-----------------------|---|----------------------|---|
| Wheel Base | 112" | Wheels | Artillery Standard—Wire Wheels Special |
| Tread | 56" | Tires | 32x4" Non-Skid Cord all around |
| Type of Drive | Hotchkliss | Springs | Semi-Elliptic 1 3/4" wide, 36" long in front, 50" in rear |
| No. of Cylinders | 4 | Steering Gear | Worm and Worm Gear Type 17" wheel |
| Bore | 3 7/16" | Speedometer | Stewart-Warner |
| Stroke | 5 1/4" | Gasoline Feed | Vacuum |
| S. A. E. Rating | 18.90 | Gasoline Tank | 18 gallon capacity in rear |
| Piston Displacement | 195.1 | Color | Lake Green, Chassis Black |
| Carburetor | Seeo Special | Upholstering | Genuine Pebble Grain Black Leather |
| Oil System | Plunger Pump and Splash | Floor Boards | Linoleum in front bound in aluminum |
| Ignition | Battery | Windshield | One-piece ventilating—with inside handle, open car. Closed cars cowl ventilator swinging windshield |
| Distributor | Connecticut | Equipment | Moto Meter, Front Bumper, Windshield Wiper, Foot rest, open car. |
| Starting and Lighting | Auto-Lite | Closed Car Equipment | In addition to above Running Board Mats, Rear View Mirror, Pillar Lock, Silver plated hardware, Marshall Springs trimmed with all wool fabric |
| Cooling | Thermosyphon, capacity of system 5 gal. | Weight | Fully equipped for road—Touring 2550 lbs. Sedan 2820 lbs. |
| Fan | 16" | | |
| Clutch | Borg & Beck (Disc) | | |
| Transmission | Selective, sliding gear, 3 speeds forward and reverse | | |
| Universal Joint | Fabric disc with centering device | | |
| Propeller Shaft | Tubular | | |
| Rear Axle | Standard Ratio 4.00 (Special 4 7/8) | | |

Detailed Specifications on Request

EARL MOTORS, Incorporated, Jackson, Michigan
Canadian Earl Motors, Ltd., Brockville, Ont.



(When Writing to Advertisers, Please Mention the Automobile Journal.)

World's Largest Automotive Office Building

NEW HOME OF GENERAL MOTORS CONTAINS MANY MODERN INNOVATIONS—HAS FOUR MILES OF CORRIDOR, 1700 OFFICES, 4726 WINDOWS AND 6884 ELECTRIC LIGHTING FIXTURES.

THE General Motors building, the largest office building of its kind in the world, is 15 stories in height, of steel frame construction, with first quality Bedford limestone facing. The research laboratory, adjacent to the office building on the south, is five stories in height, of reinforced concrete construction, with first quality Bedford limestone facing.

These two buildings have outside dimensions of 504 feet east and west by 322 feet north and south, and are connected to a 2000 horsepower power house on a railroad siding one block away by a reinforced concrete tunnel eight feet high by 11 feet wide inside, with electric tram service. A depressed drive 504 feet long by 18.33 feet wide on the elevation of the basement floor extends from Cass to Second avenues, and divides the basement of the office building from the basement of the laboratory.

THE gross floor area inside of the laboratory walls is 195,331 square feet, and in the office building 1,125,871 square feet, giving a total of 1,321,202 square feet. The total rentable area in the two buildings is 1,054,685 square feet.

The office building will contain two swimming pools, one for men and one for women, each 25 feet by 75 feet; a gymnasium 88 feet by 60 feet; 12 bowling alleys; a 31-table billiard room; barber shop; mail room, 97 feet by 52 feet; stationary supply storage, 116 feet by 80 feet; utility rooms with equipment and locker rooms. The mail room is connected to the upper floors by a bank of 28 pneumatic tubes and one independent supply and one independent return to each floor.

The first or main floor will include four 10,000 square foot and four 5000 square foot automobile show rooms; an auditorium accommodating 1500 people; a bank, trust company and the usual lobby shops. The second to the 13th floors, inclusive, will be devoted to general office space. On the 14th floor will be the executive offices, executive living suites, the executive general dining room and private dining rooms, lounge and private barber shop. The 15th floor will comprise two dining rooms, one for men and one for women, with cafeteria service; a ladies' rest room; a men's lounge and games room; hospital; doctor; dentist and nurses' office; employees' dance hall. The 16th floor will contain the valet quarters and pent house.

The office building is served by 24 high-

speed passenger elevators and two freight elevators. The laboratory building has three high-speed passenger elevators and two freight elevators. The capacity of

mately four miles of corridors, 4749 radiators, 4726 windows and 6884 electric lighting fixtures. The laboratory will contain 251 radiators, 422 windows and



This Mammoth Office Building, Largest of Its Kind in the World, Is 15 Stories in Height and Positively Fire Proof.

the entire building will be for about 6000 tenants, with about 1700 typical offices, each 20 feet by 15 feet.

The office building will contain approxi-

1032 electric lighting fixtures. There are 15,000 tons of steel in the office building frame, and 450,000 cubic feet of Bedford limestone on the two buildings.

(Continued from Page 7.)

ignition. A Borg & Beck 10-inch dry-plate clutch connects the engine with the transmission, which is in a unit with the motor. The whole unit power plant is supported in four-point flexible suspension, which holds the motor rigid against the torque reaction, but allows the frame to twist. The transmission is of the three-speed reverse sliding gear type, with all gears and shafts made of chrome alloy steel; the main shaft is mounted on large ball bearings. The hand brake is on the rear end of the transmission and is of the external contracting band type.

The power line is straight, which gives

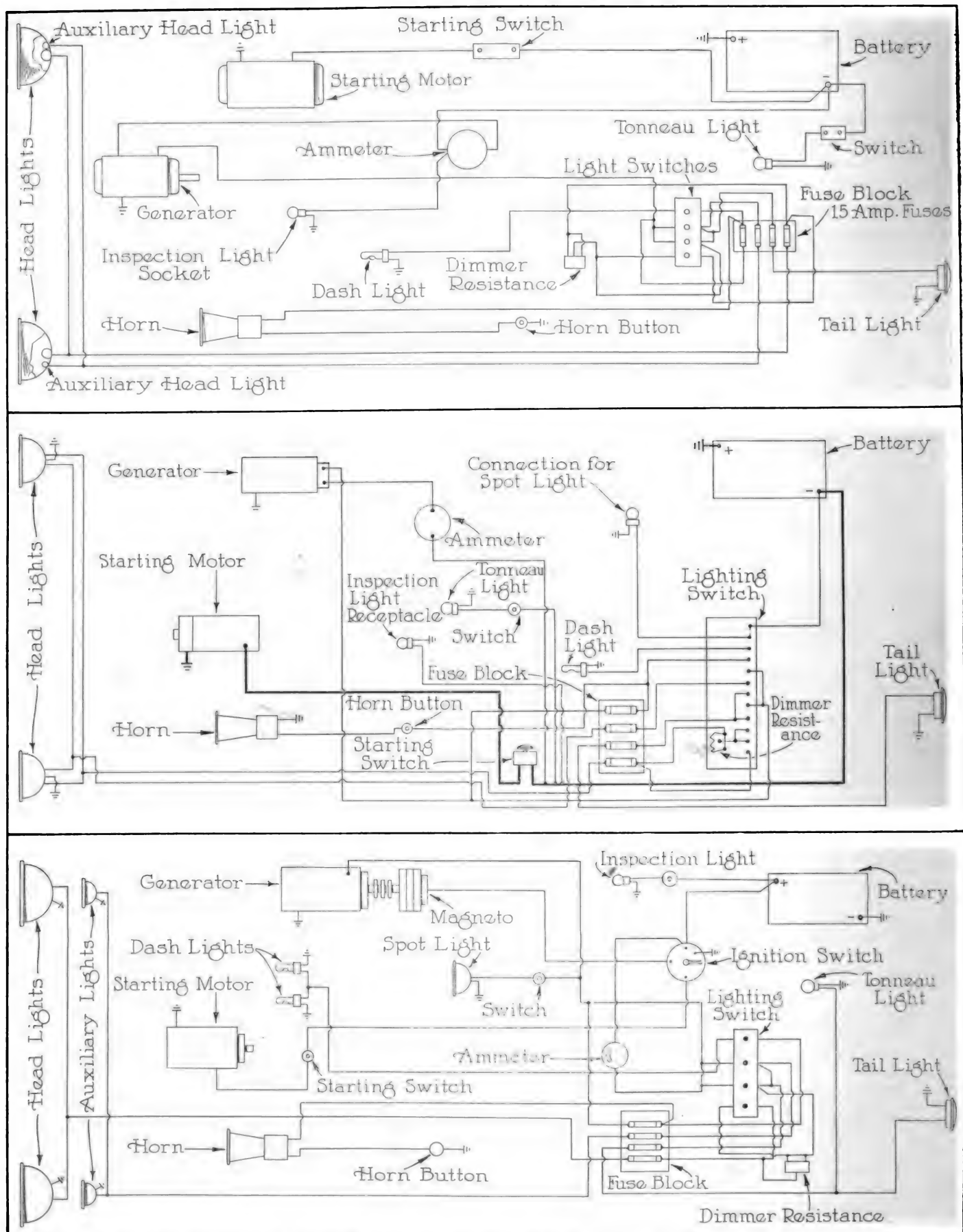
the two flexible disc universal joints a maximum angularity of five degrees. A feature which keeps the tubular propeller shafts concentric with the transmission and the rear axle shafts at all times is a special universal ball centering device which allows the fore and aft movement of the rear axle, but no eccentric movement of the propeller shaft. This device not only removes all whipping strains from the transmission and drive pinion bearings, but the universal joint discs have to transmit only a motor torque and do not have to keep the propeller shaft central.

The cooling is of the thermo-syphon

type. A large capacity zig-zag tube radiator is used with two-inch diameter hose connection. The water jacket in the cylinder is brought below the bottom position of the piston and all around the valve seats. The capacity of this cooling system is five gallons. The location of the radiator, relative to the motor, is such that the combustion chamber is just on a level with the radiator. This arrangement keeps the hot water in the top tank of the radiator and the upper half of the radiator core, and the cooler water in the motor.

The rear axle is of the semi-floating type.

Monthly Wiring Diagram, No. 21



Top, Dorris 1917, Equipped with Westinghouse Two-Unit, One-Wire System; Center, Dorris 1918, I-C Six, Equipped with Westinghouse Two-Unit, One-Wire System; Bottom, Dorris 1920-21, Equipped with Westinghouse Two-Unit, One-Wire System and High-Tension Magneto.

ACCESSORIES, EQUIPMENT AND TOOLS FOR THE GARAGE AND REPAIR SHOP

Gilliam Tapered Roller Bearings were first introduced to the trade in the early part of 1918. The general design and features of construction were soon recognized by automotive engineers as being a distinct advance in tapered roller bearings, with the result that demands were made for sizes to accommodate all makes of cars and trucks. In response to this demand the range of sizes has been increased until today the specification sheets include all the various sizes for passenger cars, trucks, trailers, tractors and general industrial appliances. This is said to be the most complete line of tapered roller bearings manufactured by any one corporation.

An improved design of cage with this bearing permits the use of the maximum number of longer rollers of the largest possible diameter. The load is thus dis-

tributed over a greater number of rollers, causing less strain upon each roller, which gives greater carrying capacity and longer life to the bearing. Simplicity combined with utility and strength are the main features of the Gilliam rollers. They have no weak sections to fracture or projections to chip off and retard lubrication. Due to their simple design they have a carrying capacity over their entire length. Each roller has a concave depression in the end of the large diameter or thrust end, which acts as a lubricant reservoir. As the bearing revolves the lubricant is drawn out of this reservoir and distributed to the various parts of the bearing by a natural law known as capillary attraction. This insures constant lubrication to all parts of the bearing at all times.



The cone and cup members are manufactured under the same careful supervision and rigid specification as the rollers and cage.

Manufactured by the Gilliam Manufacturing Co., Canton, O.

The Ideal Combination Heel Plate is so designed that the driver's foot is always in

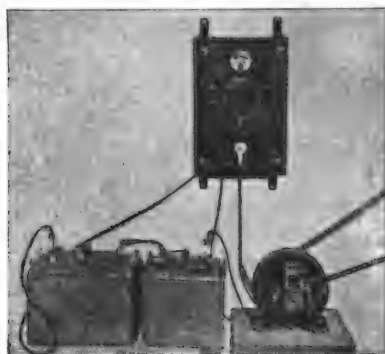


a restful position. It is a combination plate in that it has an upper and lower heel rest; the upper for a man's heel and the lower for a lady's.

It is made of aluminum, highly polished. **Manufactured by the Lexington Motor Sales Co., Indianapolis, Ind.**

The Main Battery Charging Set, No. 2. is designed for the isolated or cross roads garage which desires to enter the battery end of the business, but is handicapped by the lack of electric current. It is of 500 watts capacity, or from one to eight ordinary six-volt batteries at a time. The generator has a sliding base to take up the belt slack, oil ring bearings, etc. The switch board shows both volt and ammeter and an automatic cut in and cut out to protect the battery, field rheostat and knife switches, fuses, etc. The mountings are of pipe with flanges complete with long leads and battery clips.

This set can be driven from a gasoline engine of one horsepower, or any other source of power. Where alternating cur-

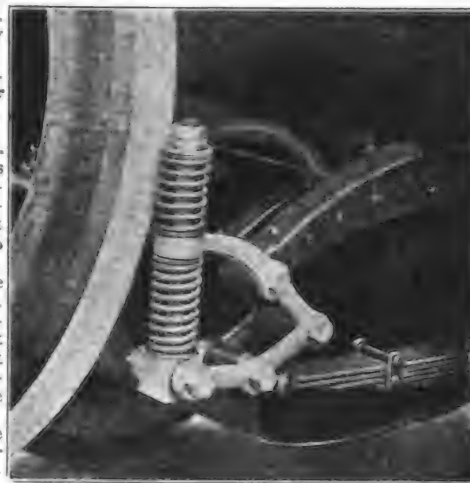


rent is available an alternating motor is used to drive the direct current generator, and this saves the current taken up usually by resistance units and will accommodate any variety of voltage batteries so long as 50 volts are not exceeded.

Manufactured by Main Electric Co., Cleveland, O.

United Shock Absorbers are stated to be distinctive from most other shock absorbers on the market today from the fact that they exemplify the scientific method of completely cushioning the automobile against both shock and rebound. This device, through the use of adjustable primary and secondary coil springs, automatically "irons out" all irregularities and rough spots in the road, at any speed, it is claimed. The primary spring absorbs the initial shock and the secondary member prevents any possibility of rebound.

An exclusive feature of United Shock Absorbers is that the spring tension is adjustable, making them ideally adaptable to practically any make of automobile except Fords. They are produced in sets of four, one for each spring. The entire weight of the car is distributed over the four shock absorbers, thus producing a



condition whereby the car literally rides on four steel cushions adjusted to the scientifically correct tension. The front set of absorbers is placed at the rear of the front springs because it is stated to be an accepted fact by automotive engineers that the brunt of the road shock is sustained at this point. On roads where numerous short, sharp bumps are in evidence, United Shock Absorbers are most efficient. The operation of the primary and secondary springs blend these severe jolts.

The completed shock absorber is enclosed in a cylindrical metal casing finished in a lustrous black. There are thus no loose parts to rattle. Each bearing is completely lubricated by a system similar to that already on the car. The accompanying illustration shows the United Shock Absorber attached to the rear spring of the car, with the metal casing removed. The lower spring absorbs the shock, the upper spring prevents rebound.

Manufactured by the United Shock Absorber Co., Kokomo, Ind. Dealers are invited to write concerning agency proposition, prices, etc.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

The Hartford Tonneau Windshield No. 10 is quickly and easily adjustable to the back of the front seat; both its front panel and wings being of sufficient height to obstruct the wind and dust from three sides. It is absolutely noiseless; the wings



fold back snugly without interfering with the extra seats. It is supplied in silver finish.

The same concern also offers the Hartford side wings, the accompanying illustration showing both of these devices in position on a standard touring car. These side wings are a practical accessory, not a mere ornament. There are no holes to cause breakage by vibration; they afford clear vision at all times; an adjustable

hexagonal clamp allows the shield to have universal horizontal movement and may be simultaneously locked. They protect the occupants of the car and are stated to be equally as necessary as the windshield. They are patterned and con-

structed for all makes of cars. They can be adjusted in hot weather to deflect a gentle, cooling breeze to the occupants of both front seat and tonneau.

Manufactured and distributed by the Sirwell Manufacturing Co., 1707 Grand Avenue, Kansas City, Mo. Price of tonneau windshield, No. 10, installed, \$80; Hartford side wings, one-half bevelled edge, nickel-plated, \$25.

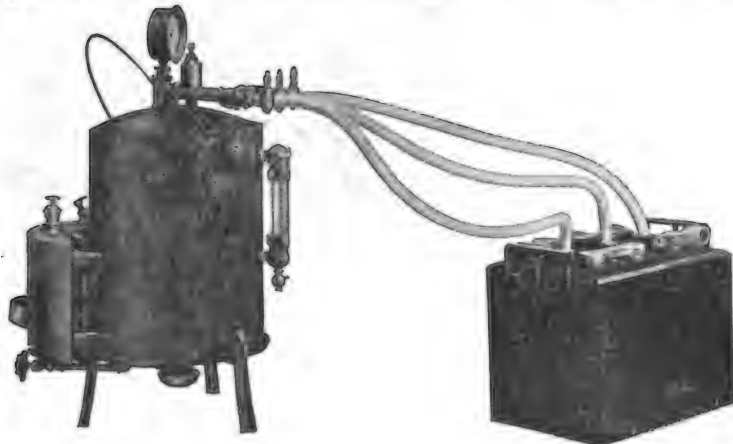
The Davison Battery Steamer is stated to be distinctive on account of its simplicity of operation, sturdiness of construction and the efficient service rendered. The heart of the steamer, its burner, is designed to operate economically and without clogging, on the low-grade gasoline now sold. If gas is available the steamer is sold equipped for that purpose.

Every battery man has broken jars, when his knife slipped in scraping off the sealing compound; he has had explosions

of this steamer is quickly made up by the labor and expense saved on a very few batteries.

Davison steamers are built of 24-gauge steel and are asbestos lined, and all joints are welded. The steamer is 24 inches high, the circumference of the boiler is 31 inches, with a capacity of 1½ gallons of water and its weight 19 pounds. Two to four ounces of pressure is all that is necessary to open a battery.

The Davison battery steamer is



due to the gas generated by the blow torch used to soften the compound. And he has spent much time and energy in trying to pry loose plates which were stuck to the bottom of the jars. The Davison battery steamer does not only eliminate all of these troubles and expense, but cleans the battery parts while doing it. The original low purchase price

equipped with steam pressure gauge, water glass gauge, safety valve, etc., with three or six hose outlets.

Manufactured by the Davison Metal Products Co., Inc., 329 East Jackson Street, Shelbyville, Ind. Garage and battery station men are invited to write direct to manufacturer if their jobbers cannot supply this equipment.

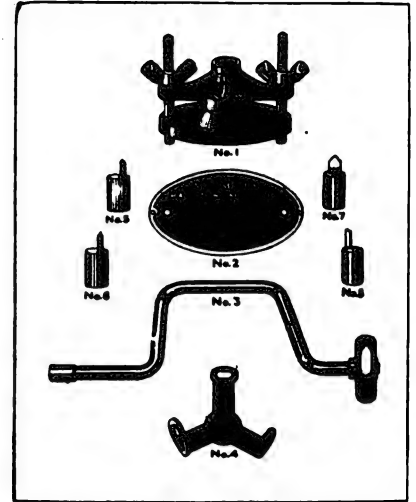
The Boyce Moto Meter Radiator Cap Driller Outfit is claimed by the maker to greatly simplify the installation of Boyce Moto Meters, making it easier for the dealer and more convenient for waiting customers. It is stated to hold the radia-

tor cap securely against rotation and enables the person making the installation to center the hole perfectly. There is no risk of chipping and splitting the surface of the radiator cap as with an ordinary twist drill. There is a drill for every

(When Writing to Advertisers, Please Mention the Automobile Journal.)

model of Boyce Moto Meter.

The complete outfit, as shown in the cut, includes: No. 1, cap driller fixture; No. 2, wall plate (with full instructions); No. 3, special brace; No. 4, Boyce Moto Meter Wrench; No. 5, Boyce 7/16-inch drill for Junior and Midget models; No. 6, Boyce 5/8-inch drill for Standard and Universal



models; No. 7, Boyce Overland reamer for Overland type models; No. 8, Boyce 3/4-inch drill for DeLuxe and truck and tractor models.

The weight, packed in a carton, is 5½ pounds.

Manufactured by the Moto Meter Co. Inc., 15 Wilbur Avenue, Long Island City, N. Y. Prices on request.

Scott Outrigger Sockets and Ford Special Windshield Attachments are used for converting old-style Ford tops into one-man tops. The Outrigger sockets attach to the upright sockets and as shown by the cuts they are used in connection with the two rear sockets and, when making the conversion, if it is desirable to use the same top covering—which is quite often the case—it is only necessary to remove the top covering back as far as the main sockets to which the outrigger sockets attach.



The Scott Ford Special Windshield Attachments are, of course, essential to the construction of a one-man Ford top, but their use does not end here as thousands



of sets are being used on Ford cars still carrying their original tops.

Manufactured by the George W. Scott Co., 1831 E at 55th Street, Cleveland, O.

The ARG Front Fender Brace is a new device which is said to rigidly and permanently protect the front fender from rattling or cutting the tires. It consists of a stout steel tube, is finished in glossy, black enamel and extends across from fender to fender, without touching lamps or radiator. The flanges at each end of the brace fit the bolt holes already made in the fenders and irons and take-up nuts are provided at each end to draw up any play. This construction provides for unusually easy and quick installation of the brace, as there are no holes to bore.

Two clips in the middle of the brace are provided, to hold the license tag steady and up out of the mud. The license tag is held far enough away from the radiator so that it does not cut off any air



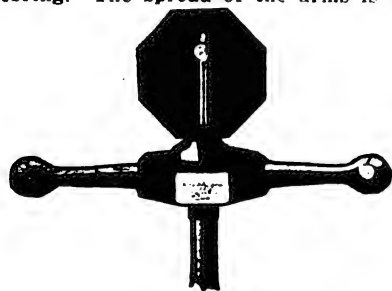
or in any way interfere with the performance of the radiator. In addition to holding both fenders tight, true and quiet, the new ARG front fender brace adds to the appearance of the car. Like the other ARG accessories, the fender brace is made of the best quality materials, and after once installed there is no subsequent service required on the brace.

The manufacturer of the ARG fender brace also makes the ARG auxiliary spring, a combination front spring protector and shock absorber for Ford commercial and passenger cars, which has met with a wide sale to Ford owners throughout the entire country.

Manufactured by the ARG Auxiliary Spring Co., Birmingham, Ala. Retail price, \$2.50. Sold only through the regular trade channels.

The Jarvis Water Indicator for Fords with racing type cap is stated to be one of the most useful and ornamental radiator devices ever offered. It warns against trouble before it develops. It answers, at a single glance, the question ever on the motorist's mind, "How about water?" by showing exactly how much is in the radiator and indicating when it is necessary to refill. In case of over-heating from other causes, such as insufficient oil, the indicator spot will attract attention by its constant motion similar to the action of a coffee percolator.

It is made of solid brass, handsomely nickelled and polished, bevelled glass, front and back, aluminum dial with raised lettering. The spread of the arms is 7 1/4



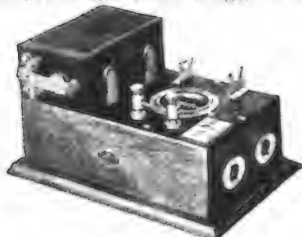
inches. The device sets neatly in place on the radiator. It is claimed to be one of the most reliable devices on the market as it is not influenced by a blazing sun, zero weather or other extreme atmospheric conditions. The cut shows the De Lux model for Fords; it is also supplied in the standard model for Fords with bevelled round top and cap center.

Manufactured by Jarvis & Jarvis, Inc., 204 Monroe Avenue, Grand Rapids, Mich. Prices on request.

The B-W Tester is a scientifically constructed instrument for testing Ford coil units, single and double contact lamps and spark plugs. It changes guess work to a certainty and saves money by eliminating waste of time. With it a full set of coils can be tested and properly adjusted in a few minutes.

The case is of hard wood, dark walnut satin wax finish, on which is mounted an accurate low reading ammeter, coil guides with contacts and spark gap. It is fitted with a high-grade indicating toggle switch. All fittings are of highly polished nickel.

To replace or readjust contact points on a Ford coil unit, an ammeter registering the correct current draw is necessary as the unit must give a hot spark with a current draw of not more than 1 1/2 amperes because the Ford magneto will not



generate more than 1 1/2 amperes at low speed. Therefore, if the coil is drawing more than 1 1/2 amperes the ignition is faulty and the car will not run smoothly at low speed.

A knowledge of electricity is not necessary to properly use the B-W Tester. It is simple to use and easily understood. Full and complete instructions are furnished with each instrument.

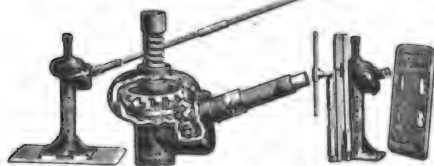
The B-W Tester is furnished in two types: D, for direct current is equipped with direct current ammeter with cord and clips for conveniently connecting to standard six-volt battery or dry cells. Type A, for alternating current, is equipped with transformer, alternating current ammeter and cord with standard plug for use in any alternating current lamp socket.

Manufactured by the B-W Electric Co., 7421 Manchester Avenue, St. Louis, Mo. Prices: Type D, \$11.65; Type A, \$14.35.

The E-Z Ball Bearing Auto Jack has, it is claimed, several distinctive features, as follows: It has an extension collapsible handle with a patented socket that holds the handle securely to the jack while placing and removing it under the car. The handle is made of 9/16-inch high-grade, cold-rolled steel, electro-plated copper finished.

It is three feet long and this permits the lifting of any car without getting under it. The head is made of hardened steel and is of the diamond-point, non-slip type. This gives a sure grip anywhere. Another new feature is the malleable, reinforced,

E-Z AUTO JACK BALL BEARING



detachable base. It is claimed that this base permits the lifting of the maximum capacity, which is 4000 pounds, in soft ground or on a hill, which could not be accomplished with a jack with an ordinary base.

It is so constructed that the ball bearings carry both the lift and the thrust, which reduces friction and makes the jack very easy to operate. It is guaranteed.

Manufactured by the O. P. Schriver Co., Cincinnati, O. If it cannot be obtained of jobbers, those interested are asked to write direct to the manufacturer.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

Upco Sheet Brass is stated to be of the highest quality, uniform in its content of copper and zinc and rolled to the required gauge with absolute accuracy. It is put up in metal-bound, screw-cover, fiber containers of cylindrical shape. Besides being the best value in uncut shim stock for the use of the gasoline engine repair man,



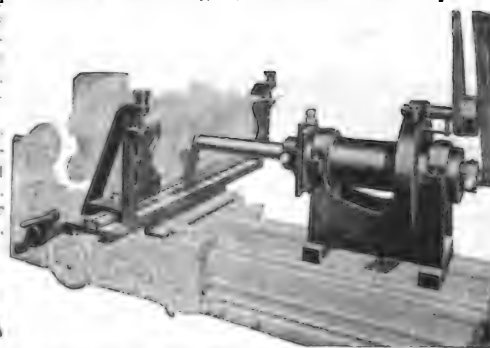
Upco assortments are produced for the convenience of all users of sheet brass in small quantities, such as mechanics, plumbers, locksmiths, jewellers, trade schools, manufacturers, laboratories and tinsmiths.

Each package contains one strip each of the following four thicknesses, 2 1/4 inches in width: .002-inch; .005-inch, .010-inch, .015-inch.

Manufactured by the Utility Products Co., Waterbury, Conn.

The Fox Cylinder Boring and Grinding Machine is a thoroughly practical outfit that will do high-class work in fast time, and in every way equal to that done on any high-grade grinding machine. The boring cut removes the excess stock and brings the cylinder bore to the approximate size. The grinding or finishing cut polishes the wall surfaces and brings the hole perfectly round and to the exact size desired. In using a combination of these two processes, which is said to be only possible with the Fox machines, great capacity can be obtained without danger of warping or distorting the cylinders, caused by the heat generated when all the stock is taken out by the grinding wheel.

The specifications of the Fox cylinder boring and grinding machine are as follows: Boring and grinding capacity, 2 1/2 inches and larger; distance from top of



carriage to center of spindle, nine inches; length of spindle, 15 1/2 inches; overall dimensions of machine, two feet, six inches by six feet; weight of complete machine, boxed, 1600 pounds. Special spindle lengths can be furnished to suit any requirement.

The following equipment is furnished: One machine, two countershafts, one cutter head, two grinding wheels, one diamond dresser, one truing-up indicator, two wrenches, one instruction sheet.

The machine is also supplied for lathe attachment, which is the same outfit with the exception of the bed, carriage and driving mechanism, which are not finished as the machine is designed for use on a lathe and all the necessary mechanism is a part of the regular lathe equipment.

Manufactured by the Sunderland Machine Shops, Omaha, Neb., the manufacturing department of the Sunderland Machinery & Supply Co.

The Penberthy FloMeter is a device invented by L. E. Van Hise and is to be located on the instrument board, its function being to tell the actual amount of gasoline that is being consumed at any moment of reading in gallons per hour. In the same way the miles per hour are shown by the speedometer, and when used in conjunction with the FloMeter the consumption of gasoline in miles per gallon is known accurately at the time of reading.

By the use of the FloMeter anyone can adjust a carburetor to the most efficient setting by simply screwing the adjustment one way or another until the speedometer shows the maximum number of miles and the FloMeter registers the minimum flow of gas. All other adjustments about a motor car can be made with the same degree of accuracy and in the same simple manner. It is no longer necessary for a man to have an intimate knowledge of mechanics to tell when his car is not up to efficiency. A glance at his Penberthy Flo-



Meter will tell him instantly whether or not his car is operating properly.

Mechanics find the Penberthy FloMeter a great time saver in aiding them to locate troubles immediately without spending time checking over all the other units in the motor car which do not need attention.

It is attractively finished in black and nickel; is inexpensive and being small can be placed on any car and can be used with any type of feed.

Manufactured by the Penberthy Injector Co., Holden Avenue and Grand Trunk Highway, Detroit, Mich.

The Detroit Wind Deflector is a good looking, useful device, reasonable in price. A touch with the hand and the wind is diverted or intensified at the driver's will. It renders positive, clear vision, having no



blind spots to obstruct the view. The glass is solid plate, not rolled, and is attached by means of two rubber-lined clamps. As no holes are bored in

the glass, vibration is eliminated and breakage minimized. It folds inside of the car parallel with the body when storm curtains are in use.

As it is packed in a strong, compact container, to prevent breakage and tampering, it is safe and convenient to order the Detroit Wind Deflector by mail.

Manufactured by the Detroit Wind Deflector Co., 3842 Grand River and Avery Streets, Detroit, Mich. Prices: Polished plate, \$15; polished bevelled plate glass, \$18; polished, bevelled and etched plate glass, \$21. In ordering by mail, specify make, model and year of car.

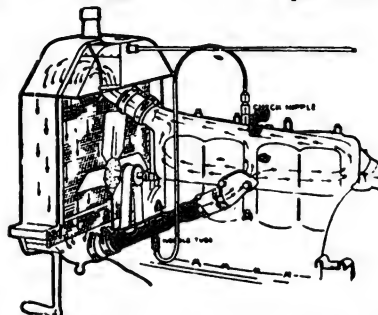
The No. 26 Needle Valve Sealing Pot is claimed to simplify the work of sealing storage batteries after they have been overhauled and assembled. The pot is designed to be hung from the ceiling about



12 inches from the work bench. The needle valve is opened and the melted sealing compound is guided in a small stream around the edge of the cells. Closing the needle valve prevents the sealing compound dripping when the pot is reheated.

Manufactured by S. R. M. Oram, Box 5814, North Philadelphia, Pa. Price, \$2.50.

The Perfection Circulator is a simple device for the uniform cooling of automobile motors. Its operation makes possible the circulation of cooling water in an exact fixed proportion to the amount of heat generated. It is claimed to provide always a dependable, uniform cooling medium entirely independent of the speed of the car, road or weather conditions; that it will save at least 20 per cent. of



fuel and oil expense; will practically eliminate the formation of carbon in the motor; will give a much smoother running motor; and will absolutely prevent overheating.

It is simple to install, the directions being as follows: First, substitute the nozzle tube for the lower outlet connection; second, drill a 21/64-inch hole and thread for a one-eighth inch pipe; third, screw in the valve and connect the small tube. The flow can be varied for winter or summer conditions by means of the valve screw.

Manufactured by the Simms Magneto Co., East Orange, N. J. List price, \$5.50.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

The Canton Portable Crane for repair shop, garage and service station trade embodies many special features desirable for this class of service. The crane is designed to handle heavy work, such as power units, freight and large pieces of



machinery around the shop. Owners claim that the crane enables them to save materially on their work and its ability to pick up its load and transport it to any part of the shop with ease recommends it to intending purchasers.

Manufactured by the Canton Foundry & Machine Co., Canton, O.

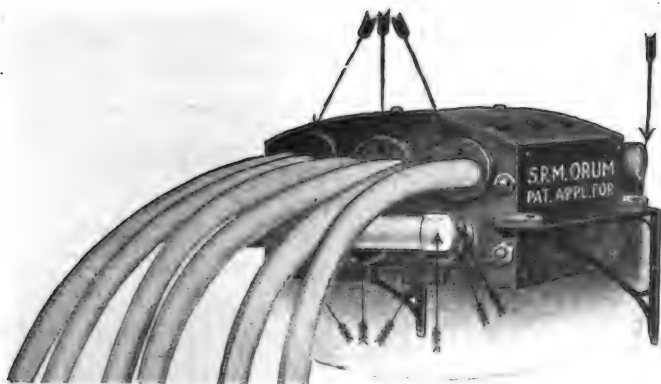
Thomson's Speed Band Renewer is a new preparation designed to overcome "chattering" in Ford speed bands. As everyone familiar with the mechanism of the Ford car knows, the speed bands run in oil. After three to five days of driving the speed band may get a hard, glazed surface, due to the heat of friction burning and crystallizing the oil on the bands. Then the brake grips like steel on steel, causing "chattering" and shaking. Thomson's Speed Band Renewer is a liquid compound and is easily applied. The maker recommends that the crank case be drained of oil before applying, but this is not absolutely necessary. The driver removes the transmission cover and loosens the speed bands. He then raises them off the top of the drum with a screw driver and pours about one ounce of the renewer on top of each band, so that it runs all



around. The speed bands are then tightened and the gears and brakes should be worked hard. This spreads the renewer and soaks it into the hard, glazed surface of the bands. The solution dissolves the crystallized oil and softens the band to its original pliability.

This newest Thomson product contains no oils or chemicals that will injure the speed bands or affect the oil in the Ford engine.

Manufactured by the Thomson Auto Specialties Co., Columbus, O. Sold by distributors in all principal cities. It is sold in 10-ounce cans, containing from one to three applications and also in gallon containers for service station use.

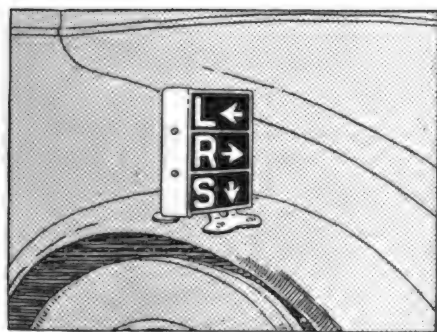


The Super-Six Steam Generator, No. 45, is a large sized outfit designed for battery stations handling a large amount of work and is equipped with six rubber tubing connections instead of three. The Super-Six fastens to the wall by means of special brackets, only burns gas when in use and is instantaneous in action, as the boiler is of the flash type, which is said to be non-explosive. Pressure gauges, safety valves or water gauges are unnecessary as the device is very simple in both operation and construction.

Manufactured by S. R. M. Orum, Box 5814, North Philadelphia, Pa. Price, \$30.

The Double Safety Signal is a hand-controlled, electrically-operated automobile signal device. The signalling portion is placed on the rear left hand fender and may be read from the front or back, thus warning the man behind, the man approaching and the traffic policeman at the corner of the driver's intention before it is too late. In most states the law requires a signal to be given when turning to the right or left and when stopping. This device provides for all three actions.

With the closed car it is impossible to give a hand warning and at night it is difficult to notify other drivers. With the Double-Safety signal it is only necessary



to manipulate a small hand lever located at a point convenient to the driver's wheel. This lever is moved down and the stop signal lights up.

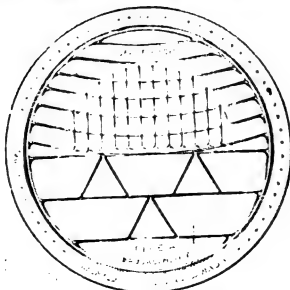
The stop signal can also be worked automatically with the clutch as well as by hand. When the hand lever is turned to the left or right, the left or right signal, respectively, is shown.

The Double Safety signal is stated to be simple to install; it is connected to the battery or light line and grounded at a convenient point. The frosted bulbs that are used can be replaced very easily. There are no mechanical parts to get out of order, and the current wires are waterproofed so that snow, rain or sleet will not affect the efficiency of the signal. The arrows pointing the direction show up in white and the initial letters in red, against a black background. The signal comes packed, complete, ready to assemble and install.

Manufactured by the Double Safety Signal Co., 192 North Clark Street, Chicago, Ill. A special offer is being made to distributors.

Benzer No Glare Lenses—A great percentage of automobile accidents which occur at night are directly traceable to blinding head lights used by motorists. As a result of this condition, state laws have been enacted which compel car owners to equip their machines with lenses that have been approved by the state.

Benzer No Glare Lenses are approved and legal everywhere. These remarkable lenses are the outcome of a life time of scientific research and experimenting by Louis Benzer. The prismatic construction of Benzer lenses produces a brilliant white light which reveals every rut and



hollow in the road, showing the ditch at the roadside and the curve in the distance at one time. There is absolutely no dangerous glare. These amazing lenses penetrate the head lights of approaching cars and reveal the running gear, so that the possibility of accidents through blinding head lights is entirely obviated.

Manufactured by the Benzer Corporation, Myrtle and Cooper Avenues, Brooklyn, N. Y.

Universal Shim Blanks have holes cut to size, ready for trimming to fit various shapes of bearings, especially for connecting rod bearings. They are packed 100 in a slide cover box, size 2½ by 1½ inch, assorted thicknesses as follows: 40 .002-inch; 40 .003-inch; 10 .005-inch; 10 .010-inch.

These blanks are made from the highest grade of brass rolled to the thin gauges mentioned, with an absolute uniformity of



thickness. The holes are perfect and clean cut. To insure accurate adjustments on the most exacting work they are claimed to be made 50 per cent. better than is actually necessary.

Assortments are also put up with 100 13/32-inch blanks for ¾-inch bolts, or 100 17/32-inch blanks for 7/16-inch and ½-inch bolts.

Manufactured by the Utility Products Co., Waterbury, Conn.



The No. 441 Swinging Bracket Steamer is mounted on a swinging bracket for the convenience of the battery repairer. Gas is used for heating water and for generating steam. Three rubber tubes lead the steam to the battery cells. No bench room is required as the steamer is fastened to the wall and may be swung in any direction desired.

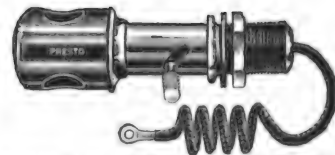
Manufactured by S. R. M. Orum, Box 5814, North Philadelphia, Pa. Price, \$18.

A New Combination Tire Iron and Jack Handle Tool is of practical usefulness in that it combines a tire iron and jack handle. The tool is of great value to automobilists in that it combines two important tools in one. It facilitates the quick handling of tires without injuring them. It is also highly recommended for

use as a jack handle, by reason of its great strength and that it fits practically any size or make of automobile jack. Its wide range of usefulness makes it fill a real need. It is small, being manufactured in 12 and 16-inch lengths. It occupies only a small space in the tool kit, no more than perhaps a screw driver. It is made of forged steel.

Manufactured by the Smith & Hemmaway Co., Inc., Irvington, N. J.

Presto Dash Lamp for Fords—Every owner of a Ford car will be interested to know that now a really good and beautiful dash lamp has been put on the market which can be easily and quickly applied by anyone; no mechanic or electrician is necessary, as there are no wires to be cut or spliced. The extra long threaded shank with nut and washer will be noticed, which permits this lamp to be applied perfectly on either an all-metal dash, or on a wood dash—metal covered, by simply boring a ¼-inch hole in the dash, inserting the shank of the lamp and tightening up the nut at the back. A sufficient length of cord is furnished with a clip, ready to slip over the tail light terminal



connection on the back of the lighting switch on the dash, to make one side of the circuit. As the lamp is single contact in construction, the other side of the circuit is, therefore, completed through the rigid metal contact of the lamp flange with the steel dash or metal covering of the wood dash.

The lamp is equipped with individual lever switch—positive in action, durable and easy to operate—and threaded into a solid brass sleeve. The entire lamp is made of heavy brass throughout, beautifully nickel plated and hand polished, which will not rust or become easily scratched or marred. It is furnished complete with a two-candlepower, 6-8 volt bulb.

Manufactured and marketed by the Metal Specialties Manufacturing Co., 338-352 North Kedzie Avenue, Chicago, Ill. Price, \$1 each.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

The Alpha Timer, which the manufacturer characterizes as the "Heart of the Ford Car," is designed to obviate timer trouble, misfiring and short-circuiting. No oiling is required and there are no oil-soaked wheels or uneven pulling. The Alpha disc is stated to be a one-piece moulding of genuine Bakelite. It does away with loose connections and exposed wires.

A description of the device as shown in the accompanying cut follows:

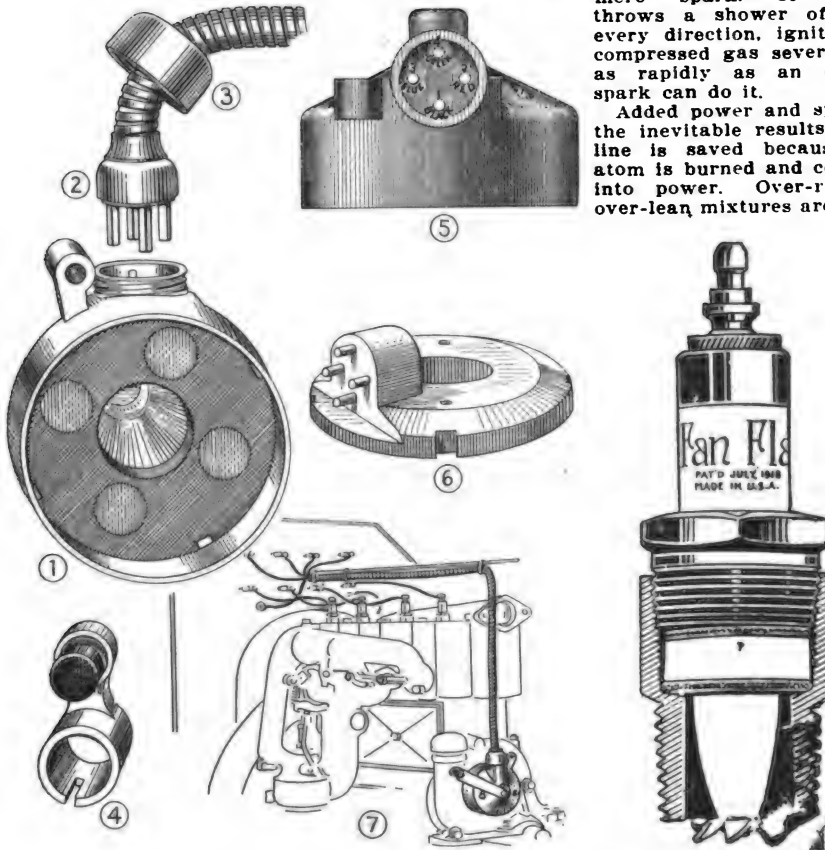
No. 1 shows front view of timer disconnected. No. 2 shows wires in cable, with split brass terminals, also round fiber plug surrounding connections. No. 3 is the screw cap which fastens the cable to the

placing no wires need be changed nor any tools be used.

Manufactured by Recto Manufacturing, Inc., Cincinnati, O. Price, complete, \$5; extra tracks, \$1 each; extra brushes, 30 cents each.

The Fan Flame Spark Plug presents a unique feature of construction in that its central electrode terminates in a miniature rotary fan which is stated to be positively heat-proof because it is 98 per cent. pure nickel. This fan is constantly rotated at high speed by the successive compressions and explosions. The whirling fan produces a circle of flame instead of a mere spark. It literally throws a shower of fire in every direction, igniting the compressed gas several times as rapidly as an ordinary spark can do it.

Added power and speed are the inevitable results. Gasoline is saved because every atom is burned and converted into power. Over-rich and over-lean mixtures are ignited



housing, making an oil or water tight connection. No. 4 is the rotar arm assembly, showing carbon brush. No. 5 is the timer housing showing position of connecting wires. No. 6 is the back view of disc; no wires exposed. No. 7 shows the proper method of attaching to motor.

Manufactured by the Alpha Timer & Accessories Co., 232 St. Paul Street, Baltimore, Md. Price, complete, \$5.

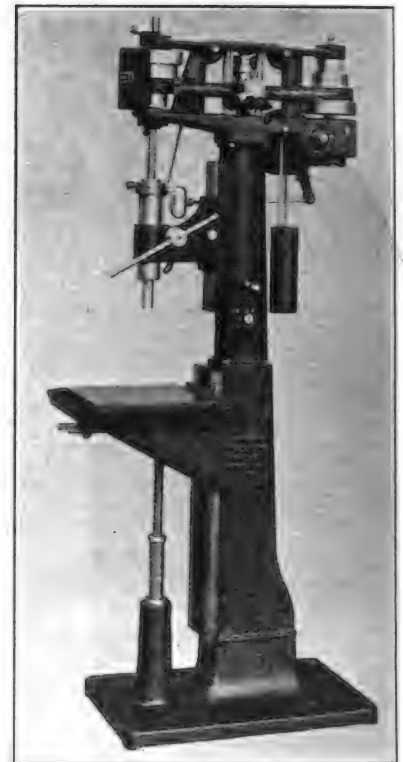
The Recto Type R-3 is a timer for Ford cars and trucks and Fordson tractors that is renewable. That spark plug porcelains and coil contact points are renewable is an undeniable advantage to the economy of car upkeep, and this is one of the strong features in this new Recto type of timer. The track and brush, when they finally



wear out, can be replaced with new parts with the same ease that an old fuse is replaced with a new one. None of the other timer parts need ever be replaced. In re-

(When Writing to Advertisers, Please Mention the Automobile Journal.)

When set as full automatic, the stop plunger is withdrawn; the spindle then automatically reverses at each end of its travel. The spindle can be stopped at any



point, reversed and brought forward by use of the control lever. Adjustable trip dogs, with limit stops, on the trip rod regulate the depth to be tapped. The chuck is driven by the clutched end of the spindle and locked in position. S. K. F. bearings are used throughout the machine.

Cincinnati Hy-Speed machines are also built in bench and belted motor drive types.

Manufactured by the Cincinnati Hy-Speed Machine Co., Cincinnati, O.

The Veco Bearing Cap Vise is used to hold the Ford motor main bearing caps and also the rod caps while they are being fitted. The hardened steel pins shown at the top are interchangeable for the two sizes, namely, $\frac{3}{8}$ inch and $\frac{1}{2}$ inch, both being furnished with the tool.

It was designed as an attachment for the Veco overhauling machine, but will be



sold separately and can be bolted to a work bench or held by the bottom lug in the jaws of an ordinary bench vise.

For sale by the Keystone Garage Equipment Co., 98 Park place, New York, N. Y. Price, \$5 each.

Lawrence Electric Garage Door Sets for folding doors have been developed through exhaustive tests to determine the most practical door set to meet the many and varied styles of garage folding doors. The result is Outfit No. 41, shown herewith, which is a standard equipment designed to fit the usual length and any breadth or thickness of door—an outfit sold complete with all parts and fittings, ready for immediate installation and operation.

Incorporated into the Electric Garage Set are many attractive and desirable features. The hangers are adjustable, which permits them to be accommodated to the



sagging, warping and swellings which so frequently occur in the doors after they are put up. This insures permanently a smooth and easily operating job. The set produces a weather-proof and weather-tight closure, guaranteeing the owner a perfect fitting in all seasons.

Installation is effected easily and quickly by following a simple set of instructions which accompanies each set. The amount of floor space required to fold back the doors is surprisingly small, thereby securing the maximum floor area in the garage for storage.

While the Electric Garage Set is pre-eminently a quality outfit, it is an especial feature that the cost is comparatively low. The initial cost is the only expense, for this set is constructed of the same high-grade materials that have been going into Lawrence hardware for 40 years. It is manufactured complete in the factory and is offered to the trade as a high-class set, attractive in appearance, designed to meet the requirements of the man who wants the very best up-to-the-minute set at a medium price.

The track is standard; the set will fit any garage door; it is sold complete.

Manufactured by Lawrence Brothers, Sterling, Ill. Prices and literature on application.

The Diamond Adjustable Wrench is a tool for the high-quality trade. It is made of drop-forged, solid, high-grade tool steel and is claimed to be the lightest, toughest, strongest, most durable adjustable



open-end wrench on the market. It is correctly hardened and drawn, like a cold chisel—not case-hardened.

It is made in all sizes; full or semi-finished, hand-polished. Each wrench is dipped in rust-proofing oil and wrapped in wax paper before being packed in a neat card board carton. The standard package is 12 dozen per wooden box of each size.

The Diamond Adjustable Wrench is absolutely guaranteed by the maker.

Manufactured by the Diamond Calk Horseshoe Co., Duluth, Minn. Price at request.

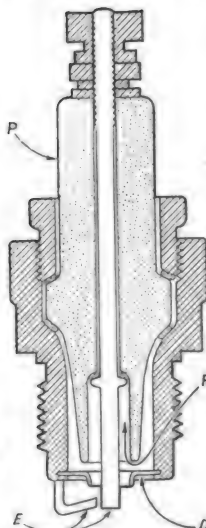
The B. G. Spark Plug, known as "the plug that cleans itself," is guaranteed against failure from carbon and against fouling by oil. As shown in the illustration and sectional view herewith, a special feature of the B. G. plug is the little "hot-spot" monel metal disc. This disc, D, heats instantaneously and remains hot. Together with the electrodes, E, and the porcelain, P, it is at a temperature that conditions the fuel at the sparking points and within the plug, by breaking up the globules of oil and gasoline into a freely burning vapor. Consequently, when ignition occurs, the vapor inside the plug,



which serves as a primary combustion chamber, not only burns cleanly, leaving no carbon, but projects a flash of fire into the cylinder. This shot gun flash scours the firing points and compels complete ignition.

In cold weather the B. G. disc heats up with the first few explosions, forming a "hot-spot," which allows a cold motor to run evenly and develop full power almost instantaneously. The B. G. plug reduces cold weather carburetor choking to a minimum.

The B. G. Spark Plug is made with carefully selected and tested nickel manganese electrodes that will not burn or pit. The insulator is a carefully designed unit of



Frenchtown "775" porcelain guaranteed not to crack from heat. The shells and coupling nuts are made from a low-carbon steel, tempered for toughness. The compression gaskets are unusually durable, made from a selected stock and are ample insurance against leaky plugs.

Manufactured by the B. G. Corporation, 33 Gold Street, New York City.

The "Red Devil" All-Steel Screw Driver has many advantages over the wood handle type, among which is the hollow

handle, combining strength and lightness. This screw driver is drop forged into two pieces and the two pieces are welded together. It is made from high-grade steel, tempered in oil; its shape fits the hand perfectly, and it does its work with the least amount of effort. The handle is knurled, giving a wonderful hand grip. The end of the handle is slightly flattened



and may be used for hammering, and the sides may also be used for driving, a combination which meets with great favor by motorists.

The "Red Devil" screw driver is sold under the fullest guarantee as to quality and finish, and it is intended that this tool shall stand rough usage. It is known as style No. 117.

Made by the Smith & Hemenway Co., Inc., Irvington, N. J.

The Boyce Moto Meter Light and Parking Lamp has been especially designed to meet the demand for a practical means of illuminating the Boyce Moto Meter for night driving. It is so constructed that a strong beam of light is directed on the face of the Boyce Moto Meter, which clearly illuminates the instrument, while no reflections are possible that would tend to confuse the driver.

This light may also be converted into a parking lamp. By turning the rear disc about one-half an inch six rear red windows are opened, which give a red danger signal that can be seen a great distance. An ingenious shutter at the rear renders the red parking lamp invisible while driving.

The Boyce Moto Meter light and parking lamp is adjustable to any car as, by the introduction of a special revolving lens, it has been found possible to cast a beam of light directly on the face of the Boyce Moto Meter. It is particularly interesting to note that only a two candle power tail light bulb is required. This has enabled the manufacturer to combine the Boyce Moto Meter light with the parking lamp, thereby eliminating the burning of three lamps while the car is parked.

The entire device is made of brass,



nickel plated throughout. Two special brackets enable it to be readily attached to the windshield of either open or closed cars.

It is claimed that this whole device is most unique yet simple in construction, and entirely in keeping with the beauty of design and workmanship so synonymous with Boyce Moto Meter products.

Manufactured by the Moto Meter Co., Inc., 15 Wilbur Avenue, Long Island City, N. Y. List price of combined light and parking lamp, \$6; a mirror may be supplied for \$1 extra.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

The Bennett Carburetor Air Cleaner was devised as a means of preventing access to the carburetor and engine of sand and dust with their destructive abrasive action on the engine's wearing parts. The Bennett air cleaner is claimed to prevent these troubles and the consequent expense by removing all dust and sand from the air before it enters the carburetor.

The action and construction of the Bennett carburetor air cleaner are very simple. The air is drawn by the engine suction through the openings in the sides of the cleaner into the spiral tubes. These



spiral tubes have a downward pitch, which gives the dust-laden air a whirl, so that centrifugal action and gravity throw the dust under the cone into the trap and allow the clean air to pass upward through the top and into the carburetor.

A small glass jar is attached at the bottom of the air cleaner, which collects the dust and sand, allowing it to be removed at proper intervals and cleaned.

Manufactured by the Wilcox-Bennett Carburetor Co., Minneapolis, Minn.

Viking Brake Lining is a specialized product, woven and impregnated in such a manner as to render it suitable to meet the unusual conditions of the Ford transmission. Special long-fiber yarn is used and the surface is closely woven so that every strand will grip the metal drum when the brake is set. The use of a double-ended filler thread gives 24 double



picks or 48 cross strands to the inch. This would seem to mean that the Viking has "body" and the strength necessary to stand up under the strain of constant use.

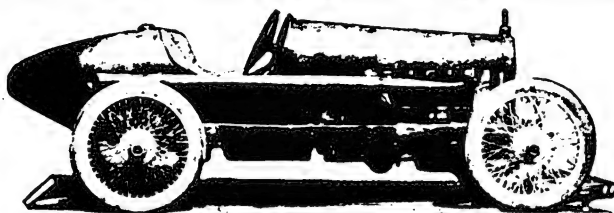
The special impregnation of the Viking adapts it to the hot oil of the Ford planetary transmission. It is claimed that it will not glaze, chatter, nor will it become mushy. While the Viking costs no more to install than ordinary linings, because of its great strength and endurance, it will wear longer and save the expense of frequent installations.

Every piece of Viking brake lining is branded with the name for the protection of users.

Manufactured by the Vogt Manufacturing Corporation, 408 St. Paul Street, Rochester, N. Y.

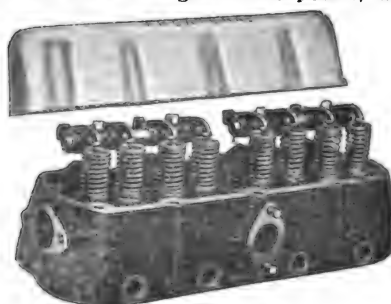
The Frontenac Cylinder Head for Ford cars is claimed to develop maximum power at minimum expense. It was designed and perfected by Louis Chevrolet, the world-famous automotive engineer and erstwhile racing driver, who designed and built the Frontenac cars that were the winners of the 500-mile races at Indianapolis in 1920 and 1921. It is of the eight-valve overhead type and is made in three models: T for passenger and commercial cars; S for Fords converted into speedsters; R, for racing cars.

Any Ford, whether a roadster, touring



car, coupe, sedan, speedster, racing car or truck, will give better service at less expense when equipped with the Frontenac cylinder head. When the change is made a motor of great flexibility will be achieved—one that will perform well under all conditions, whether at fast or slow speeds, hill climbing or pulling heavy loads.

On the commercial car, even if the speed is all that is to be desired, the Frontenac cylinder head will give more power, will



eliminate over-heating, vibration and the waste of gasoline. It will enable the truck to carry bigger loads and make faster time and thus will cut down delivery costs appreciably.

While the Frontenac cylinder head becomes an asset to any car on the second-hand market, it should be remembered that it is interchangeable from car to car. Instruction book, parts catalogue and a liberal service accompany each Frontenac sold.

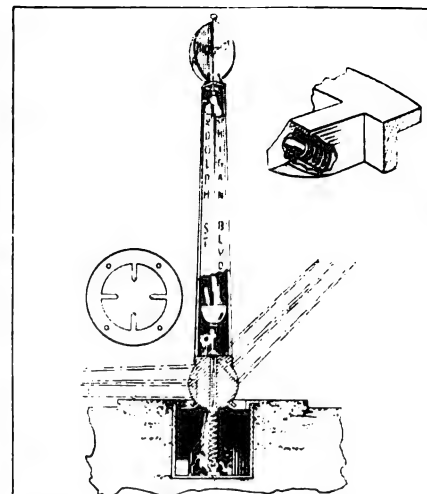
Manufactured by Chevrolet Brothers Manufacturing Co., Indianapolis, Ind. Prices: Model T, \$100; Model S, \$100; Model R, \$110; all f. o. b. Indianapolis.

The Beacon Safety Traffic Post or Standard combines safety with visibility. It is nine feet in height and is illuminated from tip to base, affording a warning to traffic and safety to pedestrians. No damage will be caused to automobiles, which strike the standard, due to its construction.

That accidents do happen where the old style standard of the immovable type is used is evidenced by the records of corners' offices in various cities. In Chicago 10 persons were killed in 12 months by automobiles colliding with so-called safety islands.

The Beacon safety traffic standard is designed to prevent the loss of life, personal injury and property loss. It is so made that when installed on a safety island it will, on being struck by an automobile, swing over in the line of the force applied by the colliding vehicle. This will happen whether the vehicle is travelling at the rate of 15 or 70 miles per hour.

Many accidents have been caused by poor illumination. Such safety standards should be visible at a distance sufficient to give timely warning and should be visible above the tops of ordinary motor cars. The height of the Beacon safety standards gives the proper visibility.



Every Beacon safety standard is provided with such visible warnings as "Go Slow," "Boul. Stop," "Right Turn," "R. R. Crossing," "Speed Limit 15 Miles Per Hour," or other wording as may be desired. The standard is illuminated in red from top to base and may be equipped with a flasher at especially dangerous points.

The Beacon safety standard costs comparatively little more than the usual safety island posts and due to its design maintenance and repairs are reduced to a minimum. The saving in maintenance will soon equal the difference in first cost.

Supplied by the Beacon Safety Post Co., 117 North Wells Street, Chicago, Ill.

The "Stax-On" is the name of a new and unique filling cap for gasoline tanks on Fords and Chevrolets. As indicated by the name, the cap stays on the tank at all times. It is not necessary to unscrew it in order to fill the tank. It is equipped with a self-acting lid, which opens and closes automatically. When a new supply of gasoline is desired the nozzle is simply pushed through the lid. When the nozzle is removed the lid closes into a leak-proof seat.

Besides the convenience in filling the tank, the cap is absolutely dust-proof. It cannot leak, and as there is no occasion to remove it there is no possibility of its getting lost. It is a wonderful time saver



not only for the driver, but also for garage and filling station men.

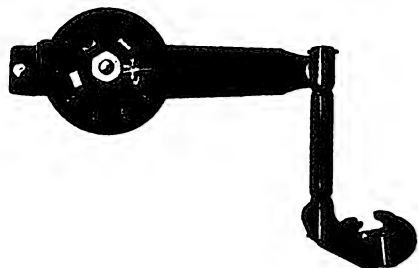
The maker says that the demand is growing enormously and the plant is taxed to capacity to fill orders. A display card holding 12 caps is supplied to dealers and it is claimed that this card alone is responsible for the sale of thousands of the caps, for the company's experience has been that the cap "sells on sight."

Manufactured by the Banco Distributing Co., Mutual Home Building, Dayton, O. Retail list price, \$1 each.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

The Hartford Shock Absorber in a new and improved model has just been placed on the market. The old Hartford has been developed into a fuller efficiency in the new Hartford. This model furnishes a really efficient spring control at a popular price—about half the former price in fact. It not only controls the springs on both compression and expansion, but controls them in degree of shock energy—the harder the shock the greater the absorption.

As the springs are kept at normal the wheels must keep to the road, saving both tires and gasoline. The usual succession of hammer-like blows is avoided when the tires thus remain on the ground at all



times. They roll instead of jump—saving the road as well as the tires.

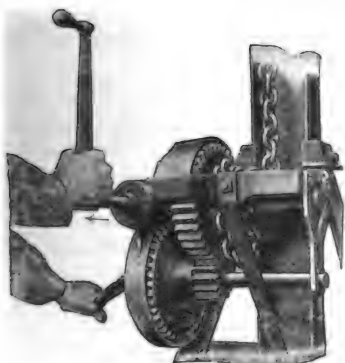
The new Hartford shock absorber contains the same basic principles which made the original Hartford so efficient but, in the new model, a tubular drag link connects the arm of the shock absorber with the axle. There are ball sockets at each which allow free side play. When the car hits a bump the springs are compressed and the arm moves up, localizing the blow in the absorber, which effectually absorbs it and in so doing exerts pressure which controls the spring action. Then, when the reaction comes, this same control again functions and gently brings the springs back to normal, keeping the wheels on the ground, preventing spring breakage and softening the jolt and jar. Because of this construction the harder the shock the greater is the resistance to jolt and jar.

There is but one model, which is quickly attachable to almost any car or light truck, due to five different fittings, the proper ones of which are included with the shock absorbers. A very few cars require one or two extra brackets for which a slight additional charge is made.

The new Hartford is being merchandized through exclusive distributors.

Manufactured by Edward V. Hartford, Inc., 35 Warren Street, New York City. Price, \$35 per set of four.

The New Weaver Truck Hoist in general design is similar to the regular type of automobile hoist that is included in the well known Weaver line. The truck hoist



is much more heavily constructed, however, being of heavy L-beam stock with a recommended lifting capacity of 6000 pounds for double suspension and 4000 pounds for single suspension.

Greater lifting leverage is gained through a compound leverage of the worm gear type giving a theoretical leverage of 600 to one. An auxiliary lever, shown in the second illustration, operates directly

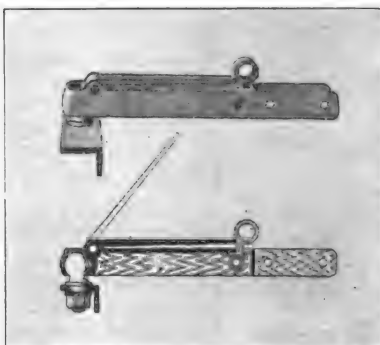


on the drum, enabling the slack chain to be quickly taken up and adjusted to the load. The width between the frame is eight feet, four inches, and the minimum height eight feet, four inches, with a maximum height of 10 feet.

Manufactured by the Weaver Manufacturing Co., Springfield, Ill.

The Corwin Truller Coupler is designed to provide at a moderate price a means for attaching trailers to automobiles or other vehicles, that will be quick to attach, give perfect freedom of motion, be safe and reliable and have no loose parts to rattle and to lose.

The perfect freedom of motion of this coupling is made possible by the ball and socket joint, the ball being suitably attached to and permanently carried by the automobile or other vehicle. The socket which fits the ball perfectly on both front and back sides is comprised of two parts: A relatively stationary part which forms the body of the coupling and is permanently attached to the pole of the trailer, and a movable locking lever of bell crank shape pivoted on the stationary part near



the point of intersection of its two arms.

One arm of this lever is reamed to fit the ball and the other arm forms a relatively long hand lever. The long arm of the locking lever is said to perform a triple function in providing a powerful means of bringing the trailer to exact locking position, of forming a flat spring which prevents wear and rattle and affording a means of locking in coupled position. The locking lever is secured in locking position by a latch which is formed with an inclined surface to automatically engage the long end of locking lever and which is pressed into position by a strong double spring.

To couple the trailer to the car it is simply necessary to place the coupling over the ball and press down on the hand lever until the latch snaps. To uncouple trailer pull back on the latch and slightly raise the trailer pole.

Made by the Corwin Coupler Co., Wells-ville, N. Y.

The Smith Woodisk Wheel is made of the same woods as used in the propellers of aeroplanes, so laminated that the grain of each layer runs in a different direction. They are about the same weight as a spoke wheel and are claimed to be four times stronger than spoke wheels against side stress—that is, skidding.

It is easy to inflate tires when the Smith

Woodisk wheels are used. The cap is snapped out in a second and all that is needed is to attach the air tube nozzle from the outside of the wheel, which is easily done, as there is ample room for nozzle and wrench for the jam nut. The air valve pocket has a positively flat cover front and back; no projection to be knocked off; no open hole or mud catcher.

The wheel band is shrunk on end grain, entirely around the periphery of the wheel; therefore it cannot loosen or squeak. No special hub is required and



the expense and inconvenience of having and carrying an extra wheel is obviated; only a spare rim and tire are necessary.

The Smith Woodisk wheels have been tested climatically and by hard road usage; they do not warp or shrink. They can have no flattened spots—always round and always run true and straight in alignment, insuring a maximum mileage.

Smith Woodisk wheels are also made to suit the needs of heavy trucks and busses. On heavy trucks they absorb shocks on account of their resiliency.

One of the main reasons for the widespread vogue of disc type wheels on passenger cars is that they give a car an appearance of elegance, smartness and trimness, which is instantly apparent to those even who are habitually unobservant. Disc type wheels add smooth, graceful lines to the car.

Manufactured by George W. Smith & Co., Inc., Philadelphia, Pa.

The Simplex Theftproof Auto Lock for Fords is designed to lock the wheels rigid in straight ahead position or to extreme left or right. It is fool proof as it can only be operated by a deliberate operation. It differs completely from other locks for Ford cars of the "loose wheel" or "spinning wheel" type and the danger feature is entirely eliminated. The Theftproof locks automatically. Simply remove the key. If anyone attempts to move the car the steering post locks as soon as the



wheels are in the straight-ahead position. Its action is exactly the same as the house front door, which locks when it is shut, provided you have set the latch. It is guaranteed for the life of the Ford car against all defects and wear and tear. It is installed in 10 minutes. Simply remove the cap at the head of the steering post, lift out the pinion gear, insert the Theftproof washer, replace the pinion, screw on the Theftproof cap, insert two taper pins which come with the lock.

Manufactured by Simplex Corporation, 2214 South Michigan Avenue, Chicago, Ill.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

TRADE OUTLET

Wanted Salesmen calling on Garage Trade to handle Bean Tools for Valve Refacing and Re-seating work. They sell on sight to skilled mechanics who want insurance against worn out tools. The very good commissions we offer make it an object to salesmen to include Bean Tools in their line. We offer exclusive territorial arrangement with active follow up support and are anxious to connect with earnest, industrious travelers and city salesmen. Address LIBERTY METAL PRODUCTS CO. (Mfrs. Bean Tools), Berea, Ohio.

Auto Mailing Lists

Send for our free complete Price List covering Auto Dealers, Owners, Ford Dealers, Truck Dealers and Owners, Garages, Auto Mfrs. and etc., any state. A. F. WILLIAMS, Mgr. of List Dept. 168 W. Adams St., Chicago. Franklin 1182.

THE CURTISS-WILLIS CO., Inc.
30 Church Street, New York
Telephone: Cortlandt 4338

The Largest Dealers in Used and New Tanks.

At the prices we make we should sell a tank every thirty minutes!

We are building and selling new tanks of all kinds in every part of the country.

We are anxious to become so well known that when a man thinks of tanks he will automatically think of Curtiss-Willis.

Classified Advertising Page.

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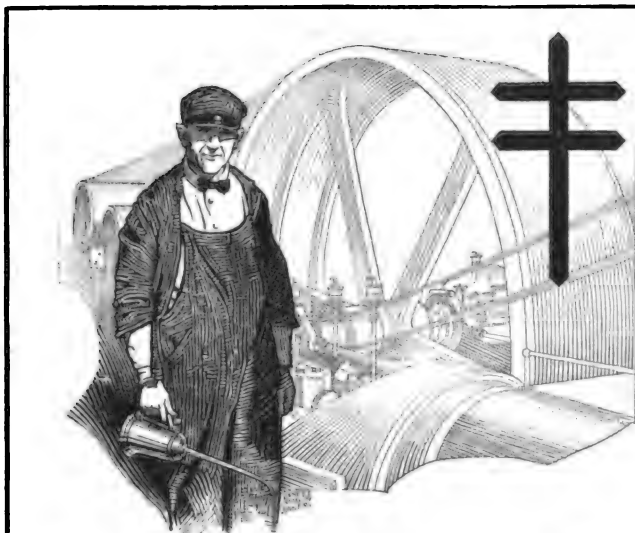
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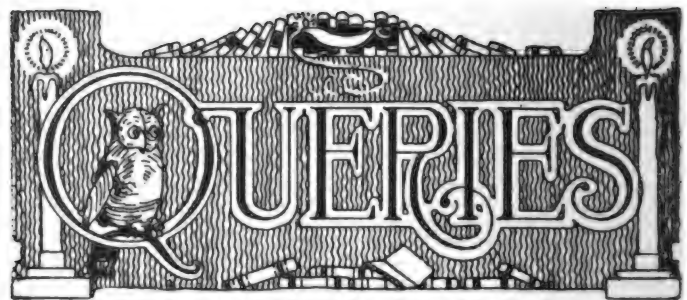
An average of 2½ years of productivity would be added to the life of every individual who reaches the age of 17, if there were no fatal cases of tuberculosis. The economic loss to America due to tuberculosis is more than \$500,000,000 annually.

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The National, State and Local Tuberculosis Associations of the United States



SPRING WIRE.

(Dr. A. J. W., Cleveland, O.)

Many a time I have wanted to make a small spring to replace a broken coiled spring in the engine of my car, but not knowing anything about this phase of mechanics I have hesitated about trying. What is necessary for this work?

The motorist who does considerable of his own repair work will often find a spool of spring wire a great convenience. When a spring is needed it is a simple matter to wind the wire around a bolt and then stretch the spring to the proper length. Light coiled springs are easily made in this manner and often saves the motorist long waits in obtaining a new one from the factory.

SPRING FLATTENING.

(E. B. B., Central Falls, R. I.)

What is the meaning of spring flattening. You hear it spoken of quite often and still one never sees it explained. I run a five-ton — truck.

It has often been remarked facetiously that a certain car has an alterable wheelbase. As a matter of fact this is literally true of almost every car, especially of those which use the Hotchkiss drive. When the springs flatten and remain so, even to a slight extent, the axles are further separated and the wheelbase is changed, perhaps an inch or two. Measuring the distance from wheel center is a good check on spring condition.

MOUNTING THE GOVERNOR.

(G. B. S., Tin Hat, Neb.)

I have taken my car down and in putting it back am having trouble with the working of the governor. How should it be mounted?

In mounting the flexible drive shaft of the governor, care must be taken that there are no bends in the shaft within two inches of either end. The shaft must never be bent into a circle of less than 10 inches in diameter. The proper method is to make all bends as long and easy as possible. It is probable a short bend caused the trouble you mention.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

TIMING VALVES OF FORD ENGINE.

(B. B. A., Raleigh, N. C.)

I would like to get information on timing the valves of a Ford engine. According to a book which I have, it states that the inlet valve should open about 10 degrees past upper dead center and close from 20 to 30 degrees past lower dead center and that the exhaust valve should close about five degrees past top dead center and opens about 35 to 45 degrees before lower dead center.

On the engine on a Ford that I have examined, the inlet valve opens according to the directions given, but stays open to about 40 to 45 degrees past lower dead center. The piston is at least one inch up on the compression stroke. The exhaust closes correctly, according to the book, but it opens about 20 to 30 degrees before lower dead center.

The Ford Manual, issued by the Ford Motor Co., states that when fitting the large timing gear to the cam shaft, it is important to see that the first cam points in a direction opposite to the zero mark. The timing gears must also mesh so that the tooth marked zero (0) on the small timing gear will come between the two teeth on the larger gear at the zero point. The timing gears now being properly set, the exhaust valve of No. 1 cylinder is open and the intake closed. The opening and closing of the valves are as follows: The exhaust valve opens when the piston reaches 5/16 inch of the bottom center, the distance from the top of the piston head to the top of the cylinder casting measuring 3 3/4 inches. The exhaust valve will close on top center, the piston being 5/16 inch above cylinder casting. The intake valve opens 1/16 inch after top center and closes 9/16 inch after bottom center, the distance from the top of the piston to the top of the cylinder casting measuring 3 3/4 inches.

Putting these measurements in terms of degrees according to the line drawing illustrating the position of the valves with relation to that of the cams and crank shaft, the inlet may open anywhere from top center to 20 degrees of fly wheel motion after center. The inlet closes from 25 to 50 degrees past lower dead center. The exhaust opens 35 to 60 degrees before lower dead center and closes from top center to 15 degrees past center.

From the description which you give of the valve timing on the Ford engine you say you examined we would say that the timing gears must be set improperly, or else excessive wear is present in the wrist pin bushings, causing the pistons to set lower in the cylinders. Better examine the timing and set the gears according to the diagram showing them properly meshed. Possibly some repair man has substituted longer pistons for the regular Ford pistons and this may give you the variation that you speak of. Check over the valves again according to these directions and see if you do not get better results after the engine is retimed.

DRIVING LIGHT IS POOR.

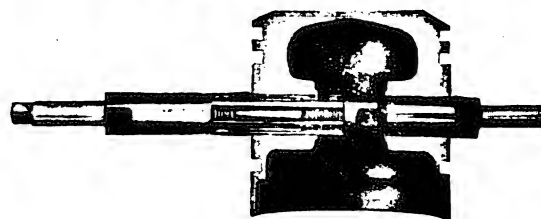
(W. R. J., New Orleans, La.)

Is there any way in which I can treat the reflectors of my head lights so that they will light the road better? They now give a very poor light.

If they are merely dusty or slightly tarnished, you can wipe their surface with alcohol on absorbent cotton or, if necessary, go over them with a fine silver polish and chamois leather, but if they are rusted or the silver surface is spoiled they will have to be resilvered or new ones obtained. Are you sure that the bulbs are so located in the reflectors as to be correctly focussed? You will probably find an adjustment by which the bulbs can be drawn slightly in or out of the reflectors and they should be so set that with the car placed at a distance of ten feet or so from a flat surface, such as a house wall, both lamps will cast equal, evenly illuminated circles of light upon it. Both lamps should be tipped at such angles, vertically and horizontally, that the beams are cast in such directions as to strike the road in the most advantageous manner. If there are no adjustments for altering the angular setting the lamp brackets can probably be bent enough to give results.

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OVERHEATING CAUSED BY PUMP.

(H. E. L., Brunswick, Me.)

My radiator steams continuously after the car has been driven 10 miles at a 20-25 mile-per-hour speed. The timing has been checked up, the circulation has been cleaned out with a radiator cleaning compound, the hose connections examined and the mixture set lean. One mechanic thinks that the water pump may be at fault. Can this be possible and what else can you suggest?

On very rare occasions the pump impeller gets loose on its shaft and fails to act. This will cause a slow circulation of the cooling water and overheating is sure to result as the passages for the water are smaller than would be the case in a thermo-syphon system and, without the pump working, this is the system that you are virtually using.

Disconnect the upper hose connection between the engine and radiator. Start the engine and observe the flow of water. If the pump is working a strong stream of water will flow from the end of the pipe, if not there will be no stream or a very small one.

Watch the lower hose connection as the engine is speeded up. If it tends to flatten there is still some obstruction in the bottom of the radiator, which does not allow the water to flow freely. Take the pump apart and probably the small taper pin which holds the impeller to the shaft will be found to be broken. Renewing the pin will restore the action of the pump. If the restriction is in the bottom of radiator, remove the lower hose connection and flush out the radiator with a stream of water from garden hose. Soft rubber connections will often restrict the water passage and can be determined by pinching the hose between the thumb and finger. If found in a softened condition, replacement is necessary.

The fan belt should be just tight enough to allow the fan to be turned by hand with a slight drag on the belt. Sometimes the gaskets between the water connections project into the passage, restricting it. Examine these and trim them with a sharp knife if they project far enough to cause trouble of this nature.

COUNTER BALANCES ON MAXWELL CRANK SHAFT.

(F. P. A., Decatur, Ill.)

Kindly advise if it would be good policy to place counter balances on the crank shaft of a Maxwell 1921 car and where they can be obtained? Is there any advantage to be gained by using enclosed spark intensifiers?

You can get the required information from the Dunn Manufacturing Co., Department F. D., Clarinda, Ia., which manufactures counter balances for the Ford, Chevrolet 490, Dodge and Overland Four, and no doubt are prepared to fit them to your car. The statement is made that they improve the pick-up of an engine, especially when slowing down for corners or traffic. Large four-cylinder engines have been cast integral with the crank shaft and their action makes a smoother running engine.

The spark intensifier is used in many cases to improve the ignition of the engine when the spark plug porcelains become broken or are otherwise unfit for use. The enclosed intensifier is really the only satisfactory type. Instances have been known where open intensifiers were in use and the car caught fire from the fumes of the gasoline under the hood.

OIL LEAKS AT END MAIN BEARINGS.

(D. S. K., Syracuse, N. Y.)

Is there any method of checking wastage of oil from the engine otherwise than by the oil gauge on the side of the engine? Oil seems to escape from the main end bearings, but I cannot seem to locate the place where it escapes.

It is not good practise to allow the oil to escape from the main bearings as it not only causes a loss of oil, but also, in coating the under side of the hood, makes a disagreeable mess. The oil gauge on the dash may often be employed as a rough check on the tightness of the bearings of the engine, especially if the crank shaft is hollow and the oil is delivered through it to the main and connecting rod bearings. When the bearings are tight the leakage will be small and the pressure of the gauge will be normal, but as wear occurs the leakage will become greater and the pressure on the gauge will drop slightly.

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Concrete
Cotton

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Fire and Water Engineering
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And the cost of selling is no small item. In some cases it costs more to sell goods than to make them. The seller who clings to antiquated, expensive methods of selling is no more entitled to your patronage than the one who runs an out-of-date factory, because you have to pay the additional costs in either case.

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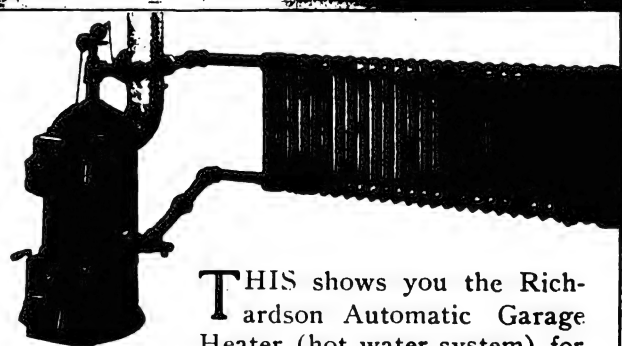
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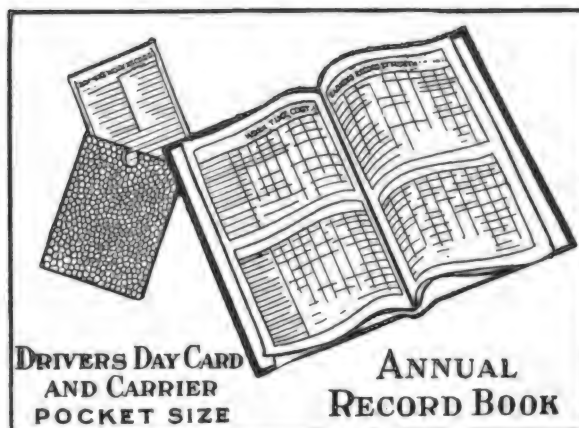
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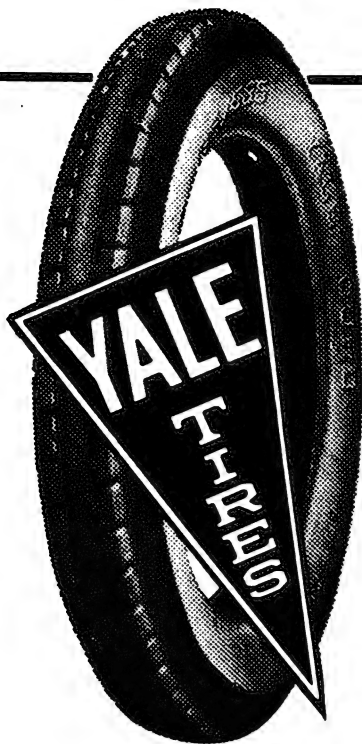
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| Size | FABRICS | CORDS | TUBES |
|-------|----------|----------|-----------|
| | Non-Skid | Non-Skid | Cord Type |
| 30x3 | 11.75 | | 2.20 |
| 30x3½ | 13.00 | | |
| 30x3½ | 16.26 | 23.75 | 2.70 |
| 32x3½ | 20.25 | 29.30 | 2.90 |
| 31x4 | 22.00 | | 3.40 |
| 32x4 | 26.70 | 36.80 | 3.45 |
| 33x4 | 28.25 | 38.10 | 3.60 |
| 34x4 | 28.75 | 39.55 | 3.75 |
| 32x4½ | 35.80 | 42.40 | 4.40 |
| 33x4½ | | 43.75 | 4.50 |
| 34x4½ | 38.10 | 44.35 | 4.65 |
| 35x4½ | 39.80 | 45.45 | 4.75 |
| 36x4½ | | 46.55 | 4.95 |
| 33x5 | | 52.35 | 5.35 |
| 35x5 | 48.00 | 54.40 | 5.60 |
| 37x5 | | 57.45 | 5.95 |
| 36x6 | | 80.80 | 9.50 |

AUTOMOBILE DIVISION

PETTINGELL-ANDREWS COMPANY

NEW ENGLAND DISTRIBUTORS

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BOSTON

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NO. 5.

Attract Good Business

Record Number of Sales Made at Closed Car Show Held by New York Dealers—Used Car Exhibition also Successful—Both to Become Annual Events.

INAUGURATED by the Automobile Dealers' association as an experiment that might aid in stimulating the sale of cars throughout the cold months of the year, the Closed Car show recently held in the 12th Regiment Armory was successful to an extent that more than justified the faith of its backers, and hereafter will be an annual event. The big armory was tastefully decorated for the occasion and there were more than 45 dealers exhibiting. At one extreme end of the huge building were seen the three Ford cars, a sedan, coupe and town car, all purchasable at considerably less than \$1000 a piece. At the other end were two fine Rolls-Royce cars, the only foreign car, by the way, in the show. Only one of these was entirely foreign made, for the second car displayed a chassis, modelled exactly on British lines and made in the factory opened last year at Springfield, Mass.

THE English-made chassis, equipped with magnificent blue cabriolet body, was priced at \$19,000. The foreign-made chassis delivered in this country can be had now for \$12,285; the American-made chassis costs \$11,750.

The sedan type of car predominated at the show, but the increasing popularity of the coupe was also noticeable. In no automobile exhibition ever given in New

York has there been so varied and splendid a display of coupes. A short time ago a coupe large enough for three passengers was considered ample. Improvements in body design now provide coupes for four and even five passengers, the Peerless showing one of the large type, the new 1922 model, with four doors. The body, finished in blue, was exceptionally roomy.

Among the new four-cylinder closed types which were keenly inspected were the new Durant and Buick fours. On the former a complete sedan and coupe were shown; the first time these models have been publicly exhibited. The Hudson cars, shown in the same booth with the new Essex, displayed the latest 1922 refinements in all of the popular Super-Six models.



Exhibitions to Be Successful from a Monetary Viewpoint Must Be Well Attended—There Are Numerous Methods of Publicity That Work Toward This General End, but It Is Doubtful If Any One of the Many That Might Be Employed Would Prove the Success That This Arch Did in Attracting the Crowds to the First Annual Closed Car Show Recently Held in New York.

Surrounded by its neighbors in black and dark color finish, the Cleveland coupe stood out conspicuously in its gray and rich brown finish. The Moon sport sedan, finished in lavender, was another distinctive model. The Packard display, which was particularly attractive, showed coupes and sedans of both the single and Twin Six types. One of the richest was a superbly finished gray and brown body of the suburban sedan type, the regular sedan body with a glass partition back of the front seats.

The Maxwell and Chalmers both exhibited new types, two Maxwells, a coupe and sedan, being equipped with disc wheels, the coupe having a folding seat for a fourth passenger. The Reo also showed something new in what is called a business coupe, designed especially for the benefit of the business and professional man or woman. It has seats for three with a large luggage compartment in the rear. Among the eight cylinders, the Cadillac, Lafayette and Cole cars showed their latest models, with every convenience for comfort. To mention but a few of the other cars worthy of inspection one might mention the Liberty, Premier, Velie, Oakland, Willys-Knight, Mitchell, Chandler, Mercer, Franklin, Roamer, Haynes, Marmon, Studebaker, Dort, Kissel, Jordan, Nash, King and Templar.

The list of cars shown and the exhibitors follow:

Buick, Buick Motor Car Co., 1733 Broadway, and the Glidden Motor & Supply Co., 258 W. 58th street, at Broadway; Cadillac, Detroit-Cadillac Motor Car Co., Broadway at 62nd street; Cole, Cole Motor Co. of New York, 1850 Broadway; Chalmers, Maxwell-Chalmers Distributing Co., Broadway and Columbus Circle; Daniels 8, A. Elliot Ranney, 244 West 59th street; Chandler, Hulett Motor Car Co., Inc., 1884 Broadway at 62nd street; Cleveland, Cleveland Motor Car Co., 1886 Broadway; Dodge, Stratton-Bliss Co., 1847 Broadway; Dort, Dort Motor Car Co., 1792 Broadway; Durant, Poertner Motor Car Co., 1759 Broadway; Essex, Hudson Motor Car Co. of New York, 1900 Broadway; Ford, Picard Motor Car Co., 1659 Broadway; Grant 6, Sidney B. Bowman Auto Co., 1922-1924 Broadway; Franklin, Franklin Motor Car Co., 1826 Broadway; Hudson, Hudson Motor Car Co. of New York, 1900 Broadway; Haynes, Haynes Auto Co. of New York, 1715 Broadway; Hupmobile, Hupmobile Co. of New York, Broadway at 62nd St.; Jordan, Sherwood Auto Co., Broadway at 63rd St.; King 8, King Motor Car Co., 1902 Broadway; Kissel, Sidney B. Bowman Auto Co., 1924 Broadway; Lafayette, Porter-Lafayette, Inc., 1783 Broadway; Liberty, A. G. Kaufman Motor Car Co., 1776 Broadway; Marmon, Marmon Auto Co. of New York, Broadway at 62nd street; Maxwell, Maxwell-Chalmers Distributing Co., Broadway at Columbus Circle; Mercer, Whiting Motor Co., 1802 Broadway; Mitchell, Mitchell Motor Co., 2 Columbus Circle; Moon, Moon Motor Car Co. of New York, 1875 Broadway; Nash, Warren-Nash Motor Corp., 1928 Broadway; National, Poertner Motor Car Co., Inc., 1759 Broadway; Oakland, Oakland Motor Car Co., 1764 Broadway; Overland, Willys-Overland, Inc., Broadway at 50th St.; Oldsmobile, Cut-

ting Larsan Co., Inc., Broadway at 59th street; Packard, Packard Motor Car Co. of New York, Broadway at 61st street; Peerless 8, Van Cortlandt Vehicle Corp., 1896 Broadway; Premier, A. G. Kaufman Motor Car Co., Broadway at 57th street; Reo, Reo Motor Car Co. of New York, Broadway at 54th street; Rolls-Royce, Rolls-Royce Co. of America, Fifth avenue; Roamer, Roamer Sales Co., Broadway at 59th street; Sheridan, Cutting Larsan Co., Inc., Broadway at 59th street; Stearns, F. B. Stearns Co. of New York, 1832 Broadway; Studebaker, Studebaker Corp. of America, Broadway at 54th street; Templar, Morrow Motor Corp., 1761 Broadway; Willys-Knight, Willys-Overland, Inc., Broadway at 50th street; Velie, Garland Auto Co., 1888 Broadway.

The Programme of the Show Was as Follows:

Monday, Nov. 14—Official
Opening, 8:30 P. M.

Tuesday, Nov. 15—Army and
Navy Day.

Wednesday, Nov. 16—World's
War Veteran Day.

Thursday, Nov. 17—Society
Day.

Friday, Nov. 18—Theatrical or
Professional Day.

Saturday, Nov. 19—Closing
Day.

Attractive Features.

A number of attractive features were arranged which, together with the efforts of the individual exhibitors to make the show a success by focussing public interest in cold weather automobiles created a strong appeal. Ray Miller and his famous Follies Bergere orchestra were engaged as a musical feature. They kept the large crowds enlivened at both the afternoon and evening showings.

The decorative scheme was designed with a great deal of care and the new features made the armory during the week a most attractive picture for an automobile setting.

The development of the closed car has shown such rapid strides that today fully 60 per cent. of the output are enclosed models. The closed car bodies on the market today are the result of nearly 20 years of concentration and careful attention to the wants and comforts of the motoring public. They comprise the thought, skill, care and ingenuity of America's and Europe's best coach builders. Each in its way demonstrated that the closed body was constructed with the idea of permanency as well as comfort.

In the auctioning of space for the Closed Car show, Harry S. Houpt, Hudson and Essex distributor, drew first place at a cost of \$710. Of the four other places which went under the hammer, Samuel Toback, Nordyke & Marmon distributor, paid \$500 for the second; Lee J. Eastman of the Packard Motor Car Co. drew third at \$350; Charles H. Larson, Oldsmobile distributor, paid \$500 for the next

space auctioned, and W. A. Woods, local Peerless dealer, paid \$400. The total amount taken in from the auction was \$2500. The remaining spaces were chosen by the exhibitors by lot.

Mr. Houpt, who was one of the show committee, has been identified with automobile shows since 1904, but says the recent exhibition is the first for New York City which may be regarded strictly as a seasonable display of automotive merchandise. With reference to the show, he said: "There is no question that the exhibition was the largest and most comprehensive display of closed cars ever held in this country. The show demonstrated that the closed car has reached a point of refinement that approaches perfection. The closed car is particularly adapted to fall and winter use, but outside of this it is the ideal 'all-year-round' vehicle for those who can afford to keep but one car. We are glad the show was a success not only from the dealer's point of view, but from the buying public's viewpoint as well."

Tire Equipment on Cars.

As usual, there was great rivalry between the big tire companies for the honor of having their equipment on the show cars, and the final count showed the following results: Goodyear, 24; Firestone, 23; Goodrich, 21; Ajax, 16; United States, 14; Fisk, 12, and Federal one. In previous years practically all show car equipment has been divided between United States, Goodyear and Goodrich.

One of the popular exhibitions in the balcony was the display of license plates from the states of the Union, provided by the New York State Tax commission. Sample plates of the 1922 license numbers which will be used by New York motorists were shown for the first time. The colors were white and green, the numerals in large white figures on a green background. Applications will be distributed to car owners probably before Dec. 1 and besides giving them out during December at the New York office, Broadway and 65th street, arrangements have been made to use four or five armories so as to relieve the congestion of the local automobile bureau.

Closed Cars of 150 Years Ago.

The closed car of 1922 is a far cry from the closed car of 150 years ago, and the contrast and advance in the coach builders' art was never before so plainly emphasized as it was at the exhibit of a French fashionable coach at the show. The vehicle shown was a reproduction of a Parisian vehicle of 150 years ago in the Moret collection. The richest of woods and exquisite inlays compose this closed car of a century and a half ago. A part of the exhibit was two young ladies dressed in the full fashion of the period, 1772. Their hair dressing, or coiffures, all of four foot in height, were heavily powdered and the attending page was also as gorgeous. In striking contrast to the 1772 exhibit was seen a 1922 Halliday closed car and a demure young lady clad in the fashionable silks and furs of 1922.

Illuminated Arch a Show Feature.

One of the striking features of the show was a handsome green, gold and white illuminated arch on the enclosed grass island on Broadway at the intersection of

62nd street, between the Cadillac and the Chandler and Marmon sales rooms. This arch, which is about 20 feet wide and the same height, could be seen a long distance up and down Broadway. It has swinging from beneath it a large dead white arrow which at night is a solid mass of electric light bulbs and pointing directly at the 12th Regiment Armory, where the show was held and which is but 200 feet away. At night a search light from the Armory bathed the arch in a flood of light. The top of the arch, of gold, carried the words "Auto Show," while below it, on a 20-foot span of pure white, were the words "Automobile Dealers Association." The 20-foot pillars of the arch were of green with trees and foliage between them. The entire assembly of this arch was classical and striking and surely attracted attention.

Used Car Show Is Big Success.

Following the Closed Car show, the first Used Car Automobile show of the New York Automobile Dealers' association was held at the 12th Regiment Armory, and good business was done throughout the entire week, many taking advantage of the opportunity to purchase a remanufactured car that could be relied on.

Forty different dealers representing that many makes of cars exhibited over 200 different models of rebuilt, repainted, guaranteed used cars, ranging from the snappy roadster for two passengers to the stately and dignified limousine for seven.

Automobile dealers some years ago began to recognize that fact that the problem of selling used cars was not alone one of price, but also one of reconstruction and for this reason evolved what might be termed the "remanufactured car."

Buyers in the market were fortunate at this show, for many of the cars on sale were taken in at a valuation prevailing in a higher market.

Sturdy 20-Year Old Car.

Among the exhibits was an old two-cylinder car which has a record of a quarter of a million miles in the last 20 years. The car, a 1902 Peerless, is still in good shape and can go out and do 35 miles an hour without any difficulty. Standing beside a 1921 Peerless eight-cylinder the contrast of a score of years was very striking, yet the features that stand out prominently are the rear-end construction, for the veteran has a full floating axle which would not shame any of leading 1921 cars on market today. The steering wheel tilts like cars of 1921 design.

The wheelbase is 103 inches. The two-cylinder 16-horsepower, four-cycle vertical motor is $4\frac{1}{2}$ by $5\frac{1}{2}$, bore and stroke. The carburetor is of De Dion type, with a separate throttle valve actuated by a governor. The ignition is jump spark, with a vibrator interrupter and coil. There is a brake on the transmission and external expanding brakes in the rear wheels. Wicker baskets attached to the tonneau provide room for tools, umbrellas and baggage, while over all is a canopy top. On the dash are the controls, or the two

relief cocks, which shut the compression on or off for easy starting.

When the cylinders of this veteran car were calipered a short time ago they showed not the slightest wear, a tribute to the seasoning and the Scotch gray iron of which they were cast.

List of Exhibits at the Used Car Show.

Buick, Glidden Motor and Supply Co., 258 West 58th street; Cadillac, Detroit Cadillac Motor Car Co., Broadway at 62nd street; Cole, Cole Motor Co. of New York, 1850 Broadway; Chandler, Hulett Motor Car Co., Inc., 1884 Broadway at 62nd street; Cleveland, Cleveland Motor Car Co., 1886 Broadway; Dodge, Stratton-Bliss Co., 1847 Broadway; Dort, Dort Motor Car Co., 1792 Broadway; Essex, Hudson Motor Car Co. of New York, 1900

BIGGEST CAR.

BRUSSELS, BELGIUM;
Nov. 14.—King Albert of Belgium owns the largest touring car in the world. It is in two sections, an ordinary automobile in front, with a large coach-like trailer attached. It has accommodations for 15 persons and sleeping quarters for 10. The trailer is made up of a kitchen, bath room and a combination lounging and dining room. The machine is designed for hunting in Africa.

Broadway; Grant Six, Sidney B. Bowman Auto Co., 1922-1924 Broadway; Franklin, Franklin Motor Car Co., 1826 Broadway; Hudson, Hudson Motor Car Co. of New York, 1900 Broadway; Haynes, Haynes Auto Co. of New York, 1715 Broadway; Hupmobile, Hupmobile Co. of New York, Broadway at 62nd street; Jordan, Sherwood Auto Co., Broadway at 63rd street; Kissell, Sidney B. Bowman Auto Co., 1924 Broadway; Liberty, A. G. Kaufmann Motor Car Co., 1776 Broadway; Marmon, Marmon Auto Co. of New York, Broadway at 62nd street; Mitchell, Mitchell Motor Co., 2 Columbus Circle; Moon, Moon Motor Car Co. of New York, 1875 Broadway; Nash, Warren-Nash Motor Corporation, 1928 Broadway; National Poertner Motor Car Co., Inc., 1759 Broadway; Oakland, Oakland Motor Car Co., 1764 Broadway; Overland, Willys-Overland, Inc., Broadway at 15th street; Oldsmobile, Cutting Larsen Co., Inc., Broadway at 59th street; Packard, Packard Motor Car Co. of New York, Broadway at 61st street; Peerless Eight, Van Cortlandt Vehicle Corporation, 1896 Broadway; Premier, A. G. Kaufmann Motor Car Co., Broadway at 57th street; Reo, Reo Motor Car Co. of New York, Broadway at 54th street; Rolls-Royce, Rolls-Royce Co. of America, Fifth avenue; Roamer, Roamer Sales Co., Broadway at 59th street; Studebaker, Studebaker Corporation of America, Broadway at 54th street; Willys-Knight, Willys-Overland, Inc., Broadway at 50th street; Velie, Garland Auto Co., 1888 Broadway; Stutz,

Parkinson Motor Sales Co., Broadway at Columbus Circle; Scripps-Booth, W. C. Poertner Co.

Accessories in the Balcony.

The balcony of the Used Car show was an interesting place to the visitor. Here were exhibited the thousand and one things that go to make up motor comfort. At one booth the visitor could inspect a most interesting display of automobile license plates from every state in the Union and foreign countries, including China, Siam and Mexico. At another booth, Lieutenant Sheridan of the New York Police Traffic division explained the different signs and traffic regulations used in New York City, including a working model of the traffic tower used on Fifth avenue. At another booth a miniature motor bobbed up and down at an alarming rate to illustrate the workings of a shock absorber. Next door a large cut-out carburetor functioned in a case.

CARE OF TIRES.

At no other time of the year is the care of tires of more importance than through the hot months of summer. The heat of the road tends to develop tire troubles that are unknown at other periods of the year, with the result that the motorist finds that tires which he considered good for many miles of service, blow out quickly without apparent cause.

The tire manufacturers warn that during hot weather the practice which has become prevalent among motorists of reducing the inflation pressure of tires is all wrong and that instead of following this practice the motorist should see to it that the tires carry the inflation pressure for which they were designed.

The notion prevails that an under-inflated tire expands with the heat of the road and supplies the proper driving inflation after the car has been run for several miles on a hot day and that a fully inflated tire expands in like proportion, eventually blowing out when the inflation reaches such a pressure that the carcass of the tire will not stand it.

Tire manufacturers scout this fallacy and quote experiments which they have conducted which, in their minds, amply prove that it is all wrong.

However, it is a good policy to watch the tires closely during hot weather and at the first sign of trouble to stop and see what is causing it. Heat from the road will heat the tire terrifically hot, so hot in fact that the hand cannot be placed on it with comfort. To guard against trouble from this source, the car should be driven moderately instead of speeded. Leaving the car standing in the open with the tires exposed to the sun will do them more harm than many miles of use.

In the spring of the year, when roads are not at their best, mud and water will work into cuts, separating the rubber from the fabric, rotting the fabric and doing untold harm to the tire. In case the tires should become cut, immediately clean them out with gasoline and stuff the hole full of tire putty, many good grades of which are on the market.

Federal Aid for Road Building Now Available

Average Cost of Roads, One-Third of Which Are Already Finished, Was \$17,500 a Mile—Will Continue to Provide Work for Quarter Million Men.

SEVENTY-FIVE million dollars becomes available as federal aid for road construction in the various states, the money to be spent under the supervision of the Bureau of Public Roads, Department of Agriculture, under the Federal Highway act, recently signed by the President. In addition, \$15,000,000 is appropriated for national forest roads. The \$75,000,000 represents the federal government's appropriation to the work of building highways in the various states and must be matched, dollar for dollar, by funds from the state treasuries, except in states where more than five per cent. of the area is unappropriated public land.

THE \$75,000,000 appropriated is for fiscal year ending June 30, 1922, and \$25,000,000 of the sum is available immediately, the balance becoming available on Jan. 1, 1922. The table shows how the money will be apportioned among the 48 states.

improvement with federal aid. This system will be divided into two classes, one of which will be known as inter-state highways and the other as inter-county highways. The inter-state highways must not exceed three-sevenths of the system selected; on them not more than

ture will maintain it out of the state's allotment and refuse to approve any new projects until reimbursement is made by the state.

What the new appropriation will mean to the country can be judged by the use to which the \$275,000,000 previously ap-

| State | Allotment | State | Allotment | State | Allotment |
|-------------|----------------|----------------|--------------|----------------|----------------|
| Alabama | \$1,553,420.67 | Maine | \$695,160.25 | Ohio | \$2,323,004.05 |
| Arizona | 1,053,281.44 | Maryland | 640,629.01 | Oklahoma | 1,752,339.44 |
| Arkansas | 1,254,142.20 | Massachusetts | 1,096,176.04 | Oregon | 1,182,663.90 |
| California | 2,462,098.53 | Michigan | 2,249,532.43 | Pennsylvania | 3,398,953.97 |
| Colorado | 1,341,175.69 | Minnesota | 2,123,597.07 | Rhode Island | 365,625.00 |
| Connecticut | 480,897.78 | Mississippi | 1,294,906.22 | South Carolina | 1,661,237.34 |
| Delaware | 365,625.00 | Missouri | 2,448,128.62 | South Dakota | 1,204,060.31 |
| Florida | 856,825.69 | Montana | 1,546,855.82 | Tennessee | 1,647,692.24 |
| Georgia | 1,997,957.58 | Nebraska | 1,581,189.50 | Texas | 4,425,172.41 |
| Idaho | 938,536.68 | Nevada | 953,436.78 | Utah | 849,417.21 |
| Illinois | 3,246,281.07 | New Hampshire | 365,625.00 | Vermont | 365,625.00 |
| Indiana | 1,958,855.41 | New Jersey | 942,870.95 | Virginia | 1,456,828.47 |
| Iowa | 2,102,872.74 | New Mexico | 1,189,823.34 | Washington | 1,103,709.77 |
| Kansas | 2,102,281.51 | New York | 3,696,447.97 | West Virginia | 802,359.77 |
| Kentucky | 1,417,178.68 | North Carolina | 1,769,333.90 | Wisconsin | 1,894,515.56 |
| Louisiana | 996,989.64 | North Dakota | 1,164,714.42 | Wyoming | 934,617.63 |

Of the appropriation of \$15,000,000 for the improvement of national forest roads, \$5,000,000 is made available for the fiscal year ending June 30, 1922, and \$10,000,000 for the following fiscal year.

The Federal Highway act in a general way resembles the Federal Aid act of 1916, but contains several new features. The administration of the act by the secretary of agriculture, and under him by the Bureau of Public Roads, remains unchanged.

The apportionment of the fund to the states is almost the same as in the previous act, the fund being divided into three parts, one part to be distributed according to population, one according to area and one according to its mileage of the rural and star mail routes. A new feature is the stipulation that no state shall receive less than one-half of one per cent. of the total fund which, in this case, amounts to \$365,625. This stipulation will increase the amount received by four of the smaller states, i. e., Delaware, New Hampshire, Rhode Island and Vermont.

Change in Use of State Allotments.

There is considerable change, however, in the manner in which a state may use its allotment. Each state must select a connected road system, not exceeding seven per cent. of its road mileage, for

60 per cent. of the state's allotment can be spent without the joint approval of the secretary of agriculture and the state highway department. The inter-county highways, which consist of the remainder of the system selected, will receive the remainder of the state's allotment.

Except in states where more than five per cent. of the area is unappropriated public land, the amount of federal aid received on any project must not exceed 50 per cent. of the estimated cost. In states where more than five per cent. of the area is unappropriated public land the 50 per cent. allotment is increased by an amount equal to one-half the percentage of unappropriated public land in the state. Before any funds can be paid to a state, the state must appropriate money, under the direct control of the state highway department to match the federal allotment, and for the maintenance of federal aid highways.

All highways in the inter-state system must have a surfaced width of at least 18 feet, unless a narrower width is deemed permissible by the secretary of agriculture. In case a federal aid highway is not properly maintained by a state, the state will be given 90 days' notice by the department; at the end of that time, if the highway is not in a good condition of maintenance, the secretary of agricul-

propriated has been put, according to officials of the United States Department of Agriculture. Practically \$200,000,000 of that money has been put to work in projects which are either entirely completed or now under construction. The exact amount was \$199,823,427 on Oct. 31. To match this amount the states have appropriated \$265,529,090, making a total of \$465,352,517.

Mileage Sufficient to Encircle the Earth.

The roads to be paid for by this money. If placed end to end, would encircle the earth and extend from New York to San Francisco on the second lap, the total mileage of the roads under construction and completed being reported by the Bureau of Public Roads as 27,000 miles on Oct. 31. Of this mileage 9555 miles are in projects which are entirely completed and the contractors discharged. The balance of 17,445 miles is in projects which are still under construction, but which were 69 per cent. completed on Oct. 31. In these projects there is therefore the equivalent of 12,000 miles of completed road, so that the completed road to date totals over 21,000 miles.

The average cost per mile of the roads built with federal aid has been between \$17,000 and \$18,000. Various types of roads have been constructed and results thus far accomplished have been good.

Stephens Salient Six Wins Favor

IN THE 1920 Rim of the World Economy run a Stephens won over all cars in class B, averaging 24 miles to the gallon of gasoline. In the 1920 Sacramento-Lake Tahoe Economy Reliability run a Stephens car won, with an average of 19.3 miles per gallon of gasoline over 261 miles of the severest mountain roads, coming through with a perfect reliability score.

In a record run between Camps Freemont and Kearney, Cal., a Stephens travelled 1197 miles over a mountain range in 40 hours and 13 minutes, without stopping the engine, at an average speed of 29.93 miles an hour. These records were made with stock cars, without special gearing or any changes.

Ample Power Furnished by Stephens Engine.

The Stephens engine is a four-cycle, six-cylinder, vertical, valve-in-head type, which engineering formulas grant 15 to 20 per cent. more power than others. Still greater power, quietness in operation and economy is obtained by Stephens engineers through a perfected method of preparing and handling the fuel.

Extra large valves permit quick and complete charging and discharging of the



Elegance of Design Combines with Well-Proportioned Lines to Make This Car a Worthy Addition to the List of Truly Fine Automobiles.

combustion chambers. The valve mechanism is enclosed and the leverage of the rocker arm is so multiplied that a low lift cam can be used, thus insuring quietness in operation with minimum wear.

Double valve springs make for quick, quiet valve-seating action. The valve tappets are adjustable while the engine is running.

Lubrication.

A highly perfected feature is the dependable oiling system. The oil pump is located in the base of the sump and the oil is pumped under pressure through the hollow crank shaft direct to the bearings. A fine spray of mist of oil is thrown over the push rods, including all of the valve actuating mechanism, a feature which still further tends to quiet operation.

Engine cooling is by means of the well-known thermo-siphon system using a full

honeycomb type of radiator. Large water jackets surround the engine cylinder.

SPECIFICATIONS.

Engine—Stephens, Six-Cylinders, Vertical, Cast En Bloc.

Bore and Stroke—3¼ by 4½ Inches; Piston Displacement, 224 Cubic Inches.

Horsepower—S. A. E. Rating, 25.3; Actual Brake Horsepower, at 2600 R. P. M., 57.

Starting and Lighting—Auto-Lite.

Ignition—Connecticut.

Carburetor—1¼-Inch Tillotson with Hot Air Attachment.

Clutch—Borg & Beck Dry Disc.

Transmission—Unit with Engine, Three-Speed Selective.

Rear Axle—Timken, Fitted with Timken Roller Bearings.

Front Axle—Timken, Fitted with Timken Roller Bearings.

Wheelbase—122 Inches.

Tread—56 Inches.

Tires—Fisk Cords, 33 by 4½ Inches, Smooth Front, Non-Skid Rear.

Adds Two-Passenger Car to Stanley Line

TO GIVE dealers a complete line of bodies, filling all requirements, the Stanley Motor Carriage Co. of Newton, Mass., has added a two-passenger car built on the regular 735 chassis.

This car should meet the requirements of those who want a strictly two-passenger body of the roadster type, with

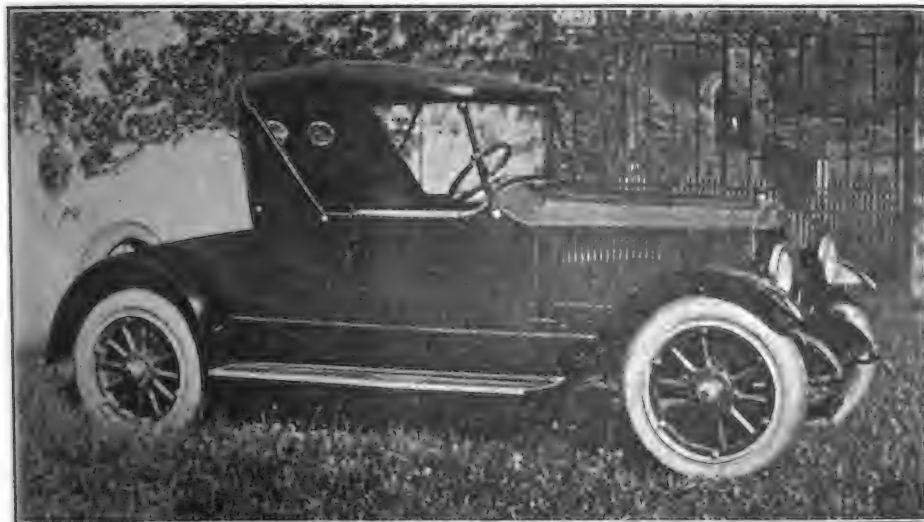
sweeping, graceful lines of dignified character and a suggestion of speed, which will attract favorable comment and yet not be a passing fad or too rakish to be comfortable.

As compared with our other open bodies the characteristics of the new roadster are as follows: The doors (hinged

at front) are one inch wider. The front compartment is two inches longer from dash to heel board. The upholstery is grain leather, semi-bright finish, and is smooth, without tufts or pleats. There are two individual seat cushions and deep arm rests.

Directly back of the seat is ample pack-age space, opening from above and available from the seat. This adds comfort to the back of the seat, improves the lines of the top, and sets the rear curtain back from the passengers' hats. The large rear compartment is assured of being always dry due to a new design of watertight joint around the lift cover. The lift cover can be raised while the top is down. The floor is hinged.

The demand for a two-passenger roadster has been and will be necessarily limited, particularly in view of the close coupled four-five passenger body manufactured by this company. This has heretofore necessitated supplying the demand with individually built bodies at what have seemed to be prohibitive prices. To obviate this, the company has placed an order with its regular body builders for a limited number of the two-passenger roadsters which are now offered at \$2800 list f. o. b. Newton. Deliveries will begin now and orders will be filled in rotation as received.



New Stanley Roadster Completes Stanley Line, Offering Steam Enthusiasts a Powerful Business Car Capable of Hard Service.

New York Chicago Shows Will Feature Good Values

Decorations, Exhibits and General Programme All Conducive to Make Annual Events of Unusual Interest—Record Number of Cars to Be Shown.

PREPARATIONS for the national automobile shows in New York and Chicago, which are rapidly nearing completion, assure those who have kept in touch with affairs that the displays will be the biggest and most comprehensive the country has ever known. The New York event, the first half of the show, will be held in Grand Central Palace, Jan. 7 to 14, and the Chicago event, the second half, in the Coliseum and Armory, Jan. 28 to Feb. 4.

S. A. Miles, manager of both displays, has been in New York for some days conferring with decorators for the Palace exhibition and, while he is not ready to divulge his programme in this respect, he promises it will surprise visitors. It is also known that automobile manufacturers throughout the country are cooperating from every possible angle to make the shows the greatest ever. This is reflected in the record number of exhibits promised.

One of the outstanding features of the 1922 show will be the great values in the cars displayed. Never before has a prospective automobile purchaser been offered as much for his money as he can now get. Ever since the war motor car manufacturers have been profiting by the lessons learned when the plants were being used by the government. As a result they have been able to reduce costs and at the same time show betterments in their products.

Automobiles surely are improving every year; the automobile shows reflect this. For the most part, however, the betterment has been noticed in body designs, coach work and finish, both interior and exterior.

There will be 94 car manufacturers exhibiting on the four floors of the Palace in January, as against 88 last year. This record number of exhibitors means that there will be nearly 400 different models shown to the New York motoring world; in fact, to those interested from all parts of the country, for New York City will surely be the mecca of the motoring enthusiast of the entire United States during the eight days of the show.

Eight new makes of cars, including two foreign, will be seen at New York. These are the Bournonville, Handley-Knight, Rickenbacker, Wills-St. Claire, Kelsey, Itala and Vauxhall. The last two named are the foreign makes that will be on display.

This year's New York exhibition will also show to the public the biggest display of accessories that has ever been located under one roof, in spite of the

fact that it was impossible to find space for many who applied for booths. In New York the accessory booths number

TIRE WARRANTY.

THE following standard claim form covering pneumatic automobile tire warranties has been approved by the Tire Manufacturers' division of the Rubber Association of America, Inc.:

"We do not guarantee pneumatic automobile tires for any specific mileage, but every pneumatic automobile tire bearing our name and serial number is warranted by us to be free from defects in workmanship or material.

"Tires claimed to be defective will be received only when all transportation charges are prepaid, and when accompanied by this company's claim form duly filled out and signed by owner. If, upon examination, it is our judgment that the direct cause of the failure of the tire to render satisfactory service is attributable to faulty material or workmanship, we will, at our option, either repair the tire or replace it for a charge which will compensate for the service rendered by the returned tire, based upon its general appearance and condition.

"Pneumatic automobile tires in which a substitute for air has been used, tires used when not inflated to the pressure recommended by us, used under loads in excess of those recommended by us, used on wheels out of alignment, abused or misused, used on rims other than those bearing these stamps (), (), (), or which have been injured through accident or design, are not subject to claim hereunder.

"This company does not authorize any dealer or agent to make any other or additional 'guaranty' or 'warranty.'"

233, and they will show a most varied line of devices and appliances that go to help the motorist. Every year something new can be depended upon from this phase of the exhibit, this branch of the trade having grown to vast proportions in past few years and being considered no longer of secondary importance.

One of the features of the show week will be the many meetings, both business and social. These have not been all arranged and cannot be mentioned in detail as yet, but it is certain that the Old Timers' club, composed of men who have been in the automobile trade since its infancy, will have one of the big parties of the week.

The following cars will be seen at the New York show:

Ambassador, Anderson, Apperson, Auburn.

Bournonville, Buick.

Cadillac, Case, Chalmers, Chandler, Chevrolet, Cleveland, Cole, Columbia, Commonwealth, Crow-Elkhart.

Davis, Detroit Electric, Dixie Flyer, Dodge Brothers, Dorris, Dort, DuPont, Durant.

Earl, Elcar, Elgin, Essex.

Franklin.

Gardner, Grant.

Handley-Knight, Hanson, Hatfield, Haynes, H. C. S., Holmes, Hudson, Hupmobile.

Itala.

Jackson, Jordan.

Kelsey, King, Kissel Kar, Kline Kar.

Lafayette, Leach-Biltwell, Lexington, Liberty, Lincoln, Locomobile.

McFarlan, Maibohm, Marmon, Maxwell, Mercer, Milburn, Mitchell, Monroe, Moon.

Nash, National, Noma.

Packard, Paige, Paterson, Peerless, Pierce-Arrow, Pilot, Premier.

Rauch-Lang, R & V Knight, Reo, Rickenbacker, Roamer.

Saxon, Sayers, Standard, Stanley, Stearns-Knight, Stephens-Moline Plow Co., Stevens-Duryea, Studebaker, Stutz.

Templar.

Vauxhall, Velie.

Westcott, Wills-St. Claire, Willys-Knight.

All of these cars will be displayed at Chicago also with the exception of the DuPont, Kline, Ambassador, Noma, Leach-Biltwell, Hatfield, Bournonville, Essex, Rickenbacker, Kelsey, Itala, Vauxhall, Stanley.

Cadillac Co. Adds Closed Body Types

THE greatest advance in style and beauty is achieved by bringing the entire car closer to the ground. The low and rakish effect is obtained without sacrificing head room. It is partially due to the use of smaller wheels carrying 33 by five-inch tires.

The new seats in both shape and resilience represent the highest standard of luxury. The leg room in the rear seat of the phaeton has been increased by three inches.

Two new and distinctive body styles have been added to the Cadillac line. The two-passenger coupe resembles the roadster in the arrangement of seats and storage space, making it an ideal car for professional use. The five-passenger coupe is equally attractive and has a wider range of utility. Entrance to the rear seat is afforded by tilting the bucket seat on the right side.

The long spark and throttle control levers formerly used on the steering wheel have been replaced by a compact arrangement which eliminates the sector and brings the controls in closer to the steering column. Only the finger grips of the new levers are exposed. In the center of the instrument board is a jet black oval plate on which are mounted the switch levers and switch lock. Below and at either side are the buttons for controlling the fuel mixture when starting and deflecting the head lights. The dials



Closed Cars Are Fast Gaining in Popularity—This Strikingly Beautiful Sedan Will Do Its Share to Swell the Ranks of All-Year Drivers.

of the ammeter and pressure gauges are grouped effectively into one instrument at the left, which balances perfectly with a similar circle containing the clock and speedometer at the right. The cigar lighter at the extreme right is now standard equipment on all Cadillac cars. All devices on the instrument board are retained by thumb nuts to facilitate removal. A single lamp is carried directly over the combination switch plate.

The beauty and refinement which mark the instrument board are in evidence through the front compartment. For example, the aluminum plates which surround the pedals and other controls in the floor boards are of handsome design and held in place by invisible screws. The pedal pads are forgings of the new aluminum alloy, duralium, which takes a high polish, is non-rusting and very durable. The adjustment for the extension of the pedals has been discontinued.

The ventilator has increased capacity and is operated by one motion of a small lever placed beneath the cowl. A windshield cleaner and rear-view mirror are

included in standard equipment.

The form-fitting windshield has a more sturdy frame than formerly and the outside screws in the supports have been done away with. A leather-covered visor is used on the enclosed cars.

The phaeton and five-passenger sedan are equipped with a trunk rack which fits between tire carrier and the rear of the body. At this point the body is protected by six vertical strips of polished aluminum, adding a decided touch of smartness to the rear view. "Kick-plates" of the same material are attached under the doors of the phaeton and five-passenger sedan.

The roofs of all enclosed bodies are the new soft type of construction, which has the advantage of deadening sound. The doors of enclosed cars have night latches to prevent unauthorized persons from gaining entrance. Attached to the inside of all doors of enclosed cars are neat metal grips, replacing the pull cords. All movable windows are equipped with mechanical window lifts.

Added Value in Chassis Refinements.

The type 61 engine is equipped with a Cadillac carburetor of new design which provides for a two-inch intake. A thermostat attached to the auxiliary air valve spring automatically readjusts the spring tension to compensate for changes in atmospheric temperature. The action of the throttle pump, which throws a spray into the carburetor, is also controlled by a thermostat to provide a richer mixture for rapid acceleration when the engine is cold.

A conduit through the center of the cam shaft carries oil which is fed through oil holes to the cam shaft bearing and also lubricates the front-end driving chains and air pump in the gasoline system. This does away with the exterior oil tubing. The splines of the cam shaft sprocket driver have been lengthened to give greater bearing surface. The chain adjustment has been strengthened.

The standard equipment of all cars provides for 33 by five-inch tires.

Prices—Phaeton, \$3790; roadster, \$3790; touring car, \$3940; two-passenger coupe, \$4540; victoria, \$4540; five-passenger coupe, \$4690; sedan, \$4950; suburban, \$5190; limousine, \$5290; imperial, \$5390. All f. o. b. Detroit; war tax to be added.

A Motoring Symphony



The Most Salient Feature of This Lincoln Car Is the General Effect of Good Proportions—It Is Unusually Well Designed and Conveys the Impression of Balance.

What Does "Heat-Treated" Mean?

Average Motorists Know Little of Processes Through Which Steel Must Pass Before Being Made into Automotive Units—This Article Explains Methods Now in Use

WHAT is the meaning of the phrase "Heat Treatment?" One sees it used in the catalogues of the passenger car, truck and tractor manufacturers in relation to steels and other metals and perhaps has a somewhat general idea of what it stands for, but it is doubtful if the layman has other than an abstract knowledge of its meaning. It may also be asserted that perhaps only a small proportion of the so-called engineers are thoroughly competent to discuss its various phases, although the nature of their work would seem to demand that they have at least a practical knowledge of the processes necessary to secure correct results. The following dissertation, embracing the fundamentals of the science, was compiled from the works of Robert B. Abbott, noted metallurgical engineer and member of the Society of Automotive Engineers, and is so written as to be easily understood by the average reader.

HEAAT treatment of steels is not new, but has been in use for ages in the tempering and hardening of metals. The ancients were familiar with its processes as relating to the preparation of steel for implements of warfare. In later years it has been used extensively by the village blacksmith in making and fitting steel shoes to horses, wagon tires and other metal parts required in body building and wheelwright work. His knowledge of the subject was necessarily limited and was more of a rule-of-thumb

method, usually handed down from father to son.

It is only of late years that the proper attention has been given to the study of this subject in universities, and research work is now carried on extensively in the engineering laboratories of the leading automotive manufacturers. Each day sees some new idea advanced which tends to show that men who have given the greater part of their lives to this subject are only now beginning to enjoy some of the results of their labors.

The heat treatment of steels has been brought to a high state of perfection during the last few years through the search for metals that would stand the hard usage necessary in passenger car, truck and tractor service, and the increasing use of these vehicles has created a demand for the best metals that could be supplied; metals of sufficient hardness to stand up and take the wear and tear without showing any appreciable effects and that would not crystallize or break readily in service. Metallurgical experts assert that the end is not yet in sight in the treatment of metals used in this industry and that as the years pass still greater improvement may be noted in the grade of metals used.

An alloy is a liquid or a solid substance composed of two or more substances, one at least of which is a metal. Steel is an alloy which in its simplest form is made up of two components, the metal iron and a chemical compound known as "cementite," consisting of carbide of iron. Sulphur, phosphorus, manganese and silicon are always present in commercial steel, but the carbon is the main factor in producing variations in the physical properties.

Heating the ordinary alloy up to the melting point causes no important changes in the components. With steel this is not true. Take an ordinary machine steel of the following composition (in per cent.):

| | |
|-------------------|--------|
| Carbon | 0.200 |
| Phosphorous | .025 |
| Sulphur | .030 |
| Manganese | .600 |
| Silicon | .150 |
| Iron | 98.995 |

From this cut several test bars and carefully anneal them. A tensile test of one of these bars gives approximately the following results:

| | |
|--|--------|
| Tensile strength, pounds per square inch | 55,000 |
| Reduction of area, per cent. | 65 |

In general the reduction of area is a fair measure of the toughness of the steel. Therefore, without any serious error, we can consider the percentage of reduction to represent the percentage of toughness. The elongation has usually been taken as a measure of this property, but it is not nearly so reliable as is the reduction.

Taking a second test bar, heating it in a furnace to a temperature of 500 degrees Fahrenheit and quenching or cooling it in water, it will be found that the physical properties have not been altered. Quenching from a temperature of 1000 degrees will give the same results. In short, it is found that no physical change can be produced in steel if we quench from any temperature until we reach approximately 1375 degrees. The bar quenched from this and higher temperatures will show physical properties similar to those given in Table I. If we use temperatures higher than 1625 degrees the change in the physical properties will be slight.

It is evident from a study of Table I that some important change has taken place in the steel at a temperature of 1375 degrees and also at about 1565 degrees. The change at 1375 degrees is a sudden one, while the second change is a progressive one, reaching its maximum at 1565 degrees. These are known as critical changes and the temperatures at which they take place are known as critical temperatures. The entire range be-

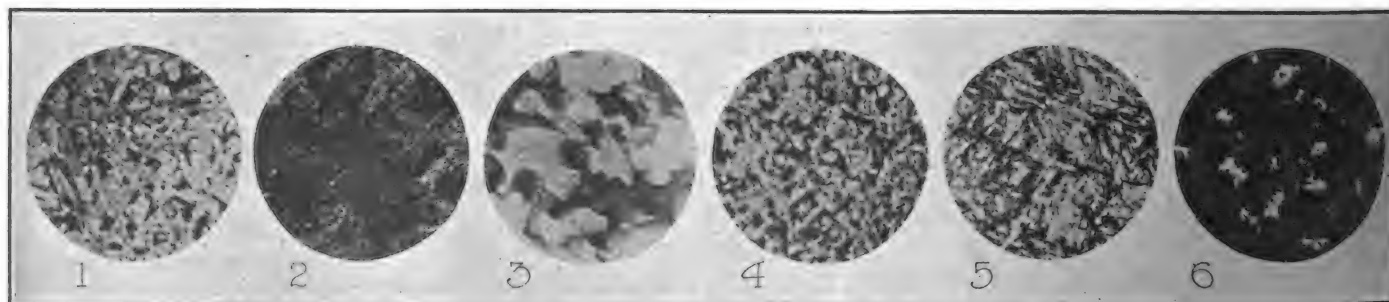


Fig. 1, Untreated Specimen of 0.20 Per Cent. Carbon Steel, Magnification 150 Diameters, Reduced About 25 Per Cent. in Reproduction; Fig. 2, Same Specimen as in Fig. 1, Magnification 1200 Diameters, Reduced About 25 Per Cent. in Reproduction; Fig. 3, Martensite, Pearlite and Iron Quenched from 1375 Degrees, Magnification 1200 Diameters, Reduced About 25 Per Cent. in Reproduction; Fig. 4, Martensite and Iron Quenched from 1440 Degrees, Magnification 150 Diameters, Reduced About 25 Per Cent. in Reproduction; Fig. 5, Same Specimen as in Fig. 4, Magnification 1200 Diameters, Reduced About 25 Per Cent. in Reproduction; Fig. 6, Martensite and Iron Quenched from 1525 Degrees, Magnification 150 Diameters, Reduced About 25 Per Cent.

tween these two temperatures is known as the critical range.

Studying Steels Under the Microscope.

If various samples of steel are closely examined under the microscope additional information can be obtained regarding the nature of the change that takes place in the critical range. Figure 1 shows the appearance of the untreated steel under the microscope, magnified 150 diameters. The white material is the pure iron. The black area consists of an intimate mechanical mixture of cementite and iron. This mixture is known as pearlite and is always uniform in chemical composition. A still higher magnification of 1200 diameters, Figure 2, shows this mixture.

The steel quenched at 1375 degrees shows but a slight change under the 150-diameter magnification. On examining the pearlite, however, under 1200 diameters, we find that it no longer consists of a mechanical mixture of cementite and iron, but that the two have apparently dissolved into each other, resulting in a homogeneous material. This is known as martensite and is the main constituent of hardened steel. Figure 3 shows this martensite during the process of formation.

Table I—Properties of Heat-Treated Bar.

| Quenching Temp. Degrees Fahr. | Tensile Strength Lbs. Per Sq. In. | Reduction of Area Per Cent. |
|-------------------------------|-----------------------------------|-----------------------------|
| 1375 | 95,000 | 30 |
| 1425 | 97,000 | 35 |
| 1475 | 99,000 | 43 |
| 1525 | 102,000 | 50 |
| 1565 | 105,000 | 55 |
| 1625 | 104,000 | 50 |

Upon examining steel quenched at 1440 degrees as shown in Figure 4, in which martensite has increased in amount and the iron has decreased, what has really happened is that the higher temperature has increased the dissolving ability of the martensite for the iron and therefore more of it has been dissolved.

Examining this martensite under magnification, Figure 5, 1200 diameters, its characteristic appearance, which is a needle-like structure, shows the crystals being arranged at angles of 60 degrees to one another. Figure 6 is the sample quenched from 1525 degrees. Here the iron has nearly disappeared. At about 1565 degrees the iron will have entirely dissolved and the steel will consist of martensite only. This is shown in Figure 7 under a magnification of 150 diameters.

As the quenching temperature rises we find no further change except a coarsening of the crystals.

All steels have two important temperatures or critical points. At the lower point the pearlite fuses together, while at the upper the absorption of pure iron by the fused pearlite is completed. The lower or first temperature is not affected by the amount of pearlite present and, since the amount of pearlite depends upon the amount of carbon, this is equivalent to saying that the lower critical temperature is independent of the carbon content. As the carbon content of the steel increases, the amount of the pearlite is correspondingly greater. Consequently the amount of iron left to be dissolved by the fused pearlite is smaller and the temperature necessary to get this into solution is lowered. The lowering of the upper absorption or critical point, because of the increased carbon content, continues until at about 0.9 per cent. carbon nothing but pearlite is present; consequently the two temperatures of change coincide.

As the carbon content increases above 0.9 per cent. the excess cementite can no longer exist as pearlite, since there is no more iron for this purpose. Consequently it must exist alone. Cementite is ordinarily glass-hard and extremely brittle. The cementite of the pearlite has this hardness and brittleness modified on account of its finely divided condition and its mixture with the soft ductile iron. As soon as the cementite has no more iron with which to mix, it occurs in large crystals, either traversing the material in flat sheets or surrounding large crystals of pearlite like an envelope. In either case it causes extreme brittleness.

Upon raising the temperature of the steel sufficiently high the fused pearlite finally dissolves all the iron and the final substance is martensite. Evidently then the martensite has a different composition, depending upon the original problem content of steel.

Martensite with a high-carbon content is extremely hard, while one with a low-carbon content is comparatively soft. A piece of hardened tool steel consists of a high-carbon martensite, while a heat-treated piece of ordinary steel consists of a low-carbon martensite, their appearance under the microscope being similar.

A steel containing more than 0.90 per cent. carbon has an excess of cementite. This dissolves in the fused pearlite, as

the temperature is raised, in the same manner that the excess iron did in the low-carbon steel.

Required Qualities for Gear Steel.

Gears, such as are used for driving or transmission in an automobile or truck, must be extremely hard. At the same time they must have a high degree of toughness or resistance to shock, this being particularly true of transmission gears. A low-carbon heat-treated steel is ideal as far as toughness is concerned, but it is not hard enough to resist the wear. A high-carbon hardened steel is ideal as far as wear is concerned, but it is too brittle to withstand hard usage.

This difficulty has been partly overcome by the use of a steel containing an intermediate amount of carbon, about 0.50 per cent. Upon heat-treating a steel of this sort, particularly when some extra alloying elements, such as nickel or chromium are present, it will give a fair degree of wear and toughness.

A better method, but one frequently not productive of the best results because of lack of correct treatment, consists in the use of a low-carbon steel that is surface case-hardened. Figure 1 shows such a steel, the use of which is theoretically ideal where hardness and toughness are required; its use can be made ideal from a practical standpoint as well by correct heat treatment.

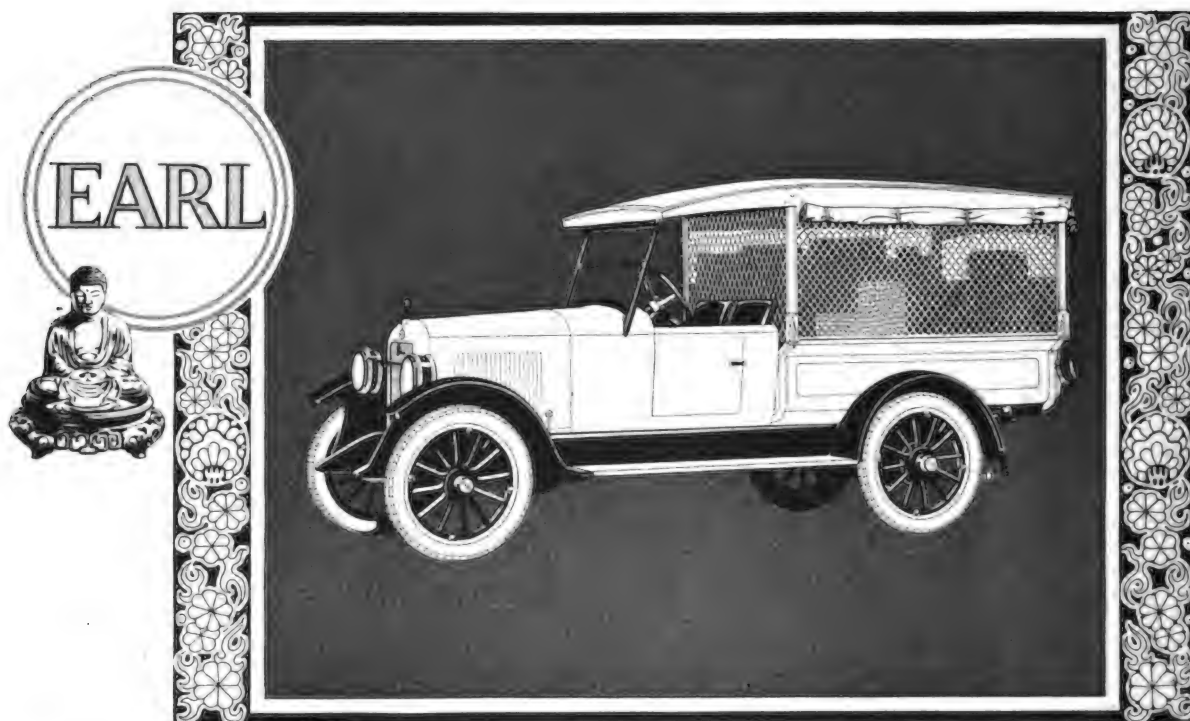
Suppose we start with a 0.20 per cent. carbon-steel gear blank which is easily machined. Packing it in carbonizing material will produce a high-carbon or tool steel surface to any depth desired, say of an 1/32 inch. In general this surface will contain a zone of carbon in excess of 0.90 per cent. at the surface and therefore contains cementite in excess of that necessary to form pearlite. Below this zone will be a zone of 0.90 per cent. carbon steel containing neither iron nor cementite in excess of the pearlite ratio; below this the carbon will grade down to the percentage of the original steel.

After the carbonization is completed the usual method consists in slow cooling in the carbonizing box. The structure of the surface is then like Figure 8. The outer surface consists of pearlite broken up by sheets or envelopes of brittle, but hard cementite. Next is a zone of pure pearlite and then a zone of pearlite and iron, the iron of which gradually increases to the composition of the steel.

(Continued on Page 18.)



Fig. 7, Martensite Quenched from 1565 Degrees, Magnification 150 Diameters, Reduced About 25 Per Cent. in Reproduction; Fig. 8, Cementite and Pearlite After Carbonization, Magnification 150 Diameters, Reduced About 25 Per Cent. in Reproduction; Fig. 9, Cementite Globules in Case, Quenched from 1575 and Then from 1380 Degrees, Magnification 150 Diameters, Reduced About 25 Per Cent. in Reproduction; Fig. 10, Core of Carbonized Steel Quenched from 1575 and Then from 1380 Degrees, Magnification 150 Diameters, Reduced About 25 Per Cent. in Reproduction; Fig. 11, Core of Carbonized Steel Quenched from 1380 Degrees, the Magnification Is 150 Diameters, Reduced About 25 Per Cent. in the Process of Photographic Reproduction.



The **EARL** *Delivery* SCREEN.

This Earl Delivery Car has a sturdiness about it that will appeal to you as a dealer.

The screen or open body, with thief-proof steel netting all around, is standard.

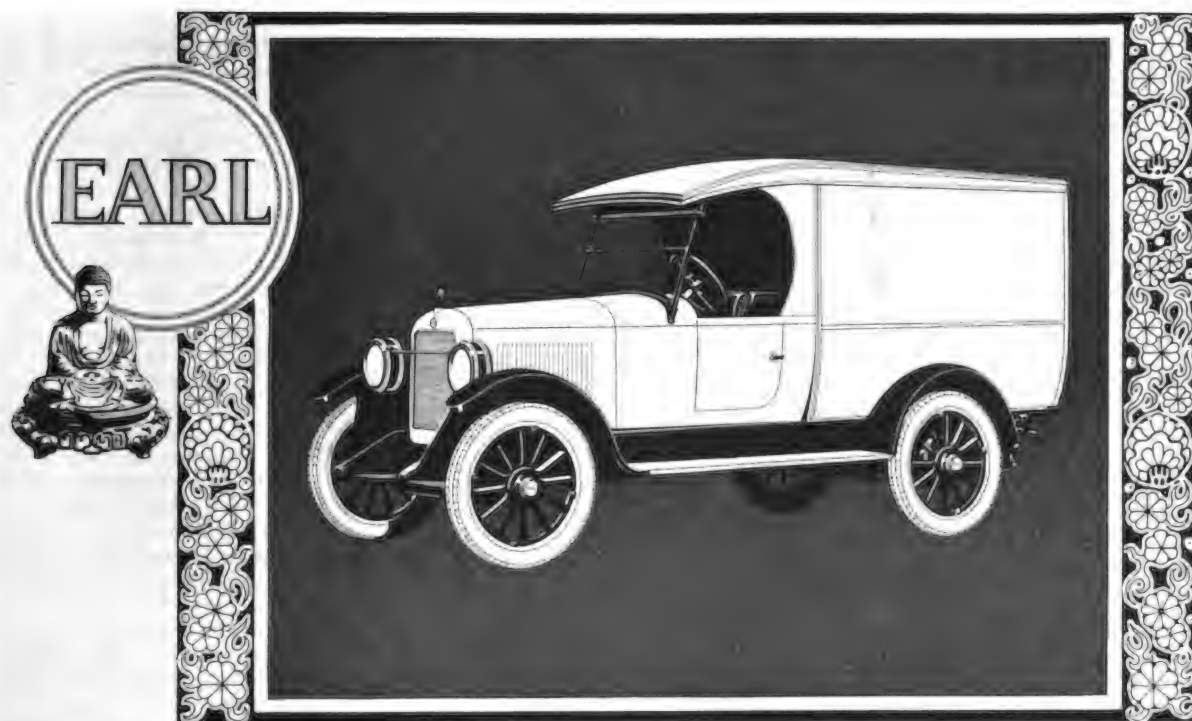
Inside width $43\frac{3}{4}$ inches; inside length 73 inches; width of flare boards inside of posts 52 inches; height from floor boards to top of tail gate 12 inches; height from floor board to top of flare board 15 inches; height from floor boards to inside of highest point of roof 49 inches; width of roof $59\frac{3}{4}$ inches; length of roof $104\frac{1}{2}$ inches, not including moulding; width between top posts 52 inches; weight front 1180, rear 1310, total 2490 with gas, oil, water and spare tire. Regular equipment includes electric head lights with non-glare lenses, cord tires all around, pressure oil gauge, gasoline gauge, motometer, spare rim, jack, tire pump, complete set of tools and storm curtains for driver's cab. Steel body—color same as Panel Delivery

\$1085

F. O. B. Jackson

EARL MOTORS Inc., Jackson, Michigan
CANADIAN EARL MOTORS, Ltd., BROCKVILLE, ONTARIO

(When Writing to Advertisers, Please Mention the Automobile Journal.)



The **EARL** *Delivery* PANEL

Well designed body lines and great strength characterize this Earl Panel Body Delivery Car. Like the screen job it has a seven-inch channel steel frame. It has a straight line drive direct from motor to rear axle through a special fabric universal joint. This prevents whipping or breakage of the driveshaft, even under exceptional strain.

Inside width 44 inches; inside height 50 inches; inside length 73 inches; height from floor boards to ground 30 inches; extreme width of roof 49 inches; extreme length of roof 112 $\frac{1}{2}$ inches; weight front 1180, rear 1340, total 2520 with gas, oil, water and spare tire. Overall dimensions, length 172 inches; width 64 inches; height 82 inches. Careful investigation shows that the average height of loading docks is 30 inches, that is 30 inches above the ground, and also the height to which the average man lifts a load without extra leverage. The color is green with black fenders, wheels and hood.

\$1160

F. O. B. Jackson

EARL MOTORS, Inc., Jackson, Michigan
CANADIAN EARL MOTORS, Ltd., BROCKVILLE, ONTARIO

(When Writing to Advertisers, Please Mention the Automobile Journal.)

(Continued from Page 15.)

Hardening this gear at the ordinary hardening temperature—that is, just above the lower critical point—all of the pearlite of the different zones will change to martensite, and the appearance under the microscope under low magnification will be about the same as that of the unhardened steel. A higher magnification will show, however, that all of the pearlite has been changed into martensite. The outer zone will then consist of a hard and more or less brittle high-carbon martensite traversed by a net of extremely brittle and hard cementite. The next zone will appear the same except that the cementite will be lacking. Below this the material will be a mixture of martensite and an increasing amount of iron. A gear treated in this manner will not show a high efficiency; the surface will be brittle, because of the cementite net work. The core will not have its maximum toughness, as it has been quenched from just above the first critical point.

Quenching from a temperature above the upper critical point (1565 degrees) will give a much higher degree of toughness from the core and at the same time cause the cementite of the case to go into solution (provided the final solution temperature of the cementite of the case is below the final solution temperature of the iron of the core, which should be the condition of affairs). Then the entire gear will be martensite, starting with a high-carbon martensite at the surface and reduced to a low-carbon martensite at the core.

Three disadvantages are found in this method of treatment: First, the hard wear resisting cementite of the case is not present; second, the core, while better than that produced by the first method, is not in the best possible condition; third, the high temperature necessary for the solution of the cementite of the case has caused a coarse crystalline structure to be formed that has disadvantages which are open to argument.

Best Method of Heat-Treating Steel Gears.

The best method consists of first treating at the high temperature as just described and then reheating at just above the lower critical temperature. Under these conditions the first quench has left the entire gear in the martensite condition. Upon quenching the second time from just above the lower critical temperature we would expect to get the same constituents as when quenching from the first time from just above the lower critical temperature; that is, cementite and martensite in the outer zone, martensite in the second zone and martensite and iron in the balance. This is what we do get, but the structural arrangement is entirely different.

The cementite of the case, instead of coming out in a net work, which represents a growth of crystallization during cooling, is now precipitated in minute globules from innumerable points. This is an ideal condition for maximum toughness corresponding to maximum wear. The entire amount of excess cementite, the hardest constituent known to steel, is

present. It is not in the form of a net work or in sheets, which will cause brittleness both because of their own large masses and on account of their tendency to break up the continuity of the hard martensite, but exists as globules, Figure 9, that give a maximum wearing surface compared to their volume.

Examining the core we find a similar condition. The iron and martensite, Figure 10, instead of forming large masses as when a single quench from above the lower critical temperature was used, Figure 11, now exist as a more or less homogeneous fiber-grained mass, which is in the best possible condition to resist fracture. In this condition its toughness is greater than if quenched from above the upper critical temperature. Evidently an extremely important point in carrying out this treatment is to quench from the lowest possible temperature above the lower critical or hardening point. A small range in temperature for this quench represents an enormous difference in physical properties, particularly with a deep case.

This is due to the fact that directly above the lower critical temperature the iron and martensite precipitate out in the finest possible state of division. As the temperature is raised each of these elements starts coalescing into larger masses. The iron also dissolves again into martensite. For the best results in carrying out this operation a lead furnace for heating and a resistance pyrometer of a high degree of accuracy are desirable.

Tempering or Drawing Steel.

This method is merely to produce a little less brittleness at the expense of some of the strength. If we treat the steel and get too much brittleness and hardness we can increase the toughness by a second heat at a low temperature so that we can get a little more toughness at the expense of hardness. Many gear manufacturers, whether they quench once or twice, draw their gears, particularly their clash gears. If the steel from which the gear is made is right at the beginning, if the first quenching temperature is above the upper critical temperature of both the case and the core and if the second quenching temperature is just above the lower critical temperature; it is not necessary to draw. But if the pyrometers or the temperatures are not right, it is frequently necessary to draw, especially clash gears.

The hardness of steel is a direct function of the strength and the latter is a function largely of the carbon content. A plain carbon steel is practically as strong as the highest type of alloy steel, but its brittleness is so great that it is impossible to take advantage of its strength. The chief advantage of alloy steel is that with a given degree of strength it has more toughness.

Carbonizing Treatment.

After the steel is placed in the carbonizing material the boxes are sealed with clay around the top, and if they leak it does not matter. As a matter of fact, all of the boxes leak because clay soon dries out with the heat and cracks. The leakage cannot be prevented, because the process of carbonizing produces gases all

the time the box is in the furnace, and they must escape.

The absolute temperature of the resistance instruments are seldom checked on this work. These instruments frequently are 10, 15 or 20 degrees in error. This error increases as the instruments grow older because of the platinum volatilities, the wires become thinner, their resistance is greater and the temperature (as indicated by the instrument) is higher. The best results are obtained as follows: Each morning the man who is working on the furnaces is provided with several test bars that are packed with the material with which he is working. He knows that the hardening temperature for his instrument will be about 1290 degrees for nickel steel and that it changes slowly; he also knows from day to day what this hardening temperature is. He quenches a test bar at 1289 degrees and finds that it will not harden. He tries 1290 degrees, and finds that it will harden at 1291 degrees and uses this temperature for that day.

Lead baths are used entirely for this work as an open furnace could not satisfactorily be employed and get the temperature within one or two degrees. It is not necessary that the actual temperature of the furnace be known, as all that is required, is a check each morning. When the instrument is 25 or 30 degrees high the resistance bulbs are changed for new ones.

Fire clay is used so that the carbonizer will not burn the top of the boxes.

Time Element in Heat Treatment.

In figuring the lowest temperature that can be used and the shortest time within reason for softening a so-called hard steel, a rise of three degrees means more than three hours' time after a certain point is reached because the temperature is far more important than the time element. One argument given against the fact that time (beyond a second or two) has anything to do with heat treatment is that hardened pieces of steel have been found in the Pyramids. They are file-hard today and the temperature at the Pyramids has been fairly high at times. If they have not softened in that time at temperatures around 130 degrees, it is impossible to expect to work at these low temperatures within a reasonable length of time. After a piece of steel is thoroughly heated, time does not affect its commercial heat treatment.

Slow drawing back in heat treatment makes no appreciable difference as shown by careful experimentation. One experimenter took 100 test bars, quenched them from the upper critical temperatures and then drew them back and put them in a bath that held five tons of lead. He next heated this slowly, bringing the bars to different temperatures, took out two at 750 and two more at 755 degrees, and so on up to 1000 degrees, quenching one in water, cooling the other in air, and then made them all standard test bars. The hundred test bars showed no appreciable difference in strength. Making only a few tests the impression might be given that the quenching was bad, but the strengths of the 100 test bars were so nearly the same that the differences were negligible.

Merit Car Truly an Aristocrat

MERIT car, made by Merit Motor Co., Cleveland, O., is one of the late comers into the automotive field, showing three models, a four-passenger sport, roadster and touring car. Well-known units are used throughout and the complete job shows high-grade finish and careful engineering and designing.

The car is powered by a 7R Continental Red Seal six-cylinder engine having a bore of $3\frac{1}{4}$ inches and stroke of $4\frac{1}{2}$ inches and develops on brake test an average of 55 horsepower. The statement is made that the engine is free from troublesome vibration and that oil is fed to all important engine bearings by pressure.

The radiator is of cellular construction, non-bursting type, fitted with a separate shell.

The clutch is a Borg & Beck single-plate, dry-disc type, which is smooth and positive in action. The transmission is a selective sliding gear type having three speeds forward and one reverse.

The carburetor is the latest type Stromberg, while the ignition is furnished by battery in connection with a Delco two-unit starting and lighting system.

The frame is of $5\frac{1}{2}$ -inch channel section alloy steel with five cross members, hot rivetted in all joints. Semi-elliptic springs are used front and rear, made of chrome vanadium steel. The front springs are 40 inches long and the rear $58\frac{1}{2}$ inches. The rear springs are underslung, fitted with extra long hangers, which produce wonderful riding qualities. The axles are of Columbia manufacture, the



This Well-Designed Car, One of the Late Comers into the Automotive Field, Has All the Ear Marks of a Thoroughbred.

rear member being the three-quarter floating type, using a one-piece housing and fitted with Bock bearings. The front axle is a drop forged I-beam possessing great strength and rigidity.

The rear wheel drums are fitted with a 14-inch contracting service brake and a 14-inch expanding emergency brake.

Three styles of bodies are mounted on the chassis, each including a permanent roof, which is rain-proof, and door-opening curtains. Large plate glass windows are placed at the rear and sides, while the top is finished in colors to match the finish of the aluminum bodies.

The prices of the two-passenger and four-passenger models were recently reduced from \$2245 to \$1985.

The upholstery is genuine leather and matches the finish of the body. The windshield is a permanent fixture, made of one-piece glass, which prevents squeaks and rattles. Clear vision is thus assured and it is absolutely weather-proof. A ventilator is provided in the cowl which cools the driving compartment during hot weather.

The complete equipment consists of motometer, spot light, foot and robe rails, tonneau light, speedometer, electric horn,

oil gauge, ammeter, trouble light connection, windshield cleaner and tool kit.

The wheelbase is given as 119 inches and the tire equipment includes five cord tires 32 by four inches.

The Hankee Signal

A SIGNALLING device which attracts considerable attention wherever shown is attached to a Chevrolet 490 touring car owned by J. N. Kelly, 11 Rosewood street, Pawtucket, R. I.

In approaching traffic officers the device, which consists of two metal arrows, one at each side of the windshield, is operated by a small electric motor in each arrow from the current of the storage battery of the car. Push buttons are located convenient to the driver's left hand below the steering wheel, in a metal box clamped to the steering post. The arrows are dropped from vertical to horizontal according to the turn the driver wishes to make. The signal is immediately seen by the traffic officer and the order to turn given the driver.

It was noticeable how quickly the traffic officer heeded the signal and, without hesitation or question on his part, gave the proper turning signal.

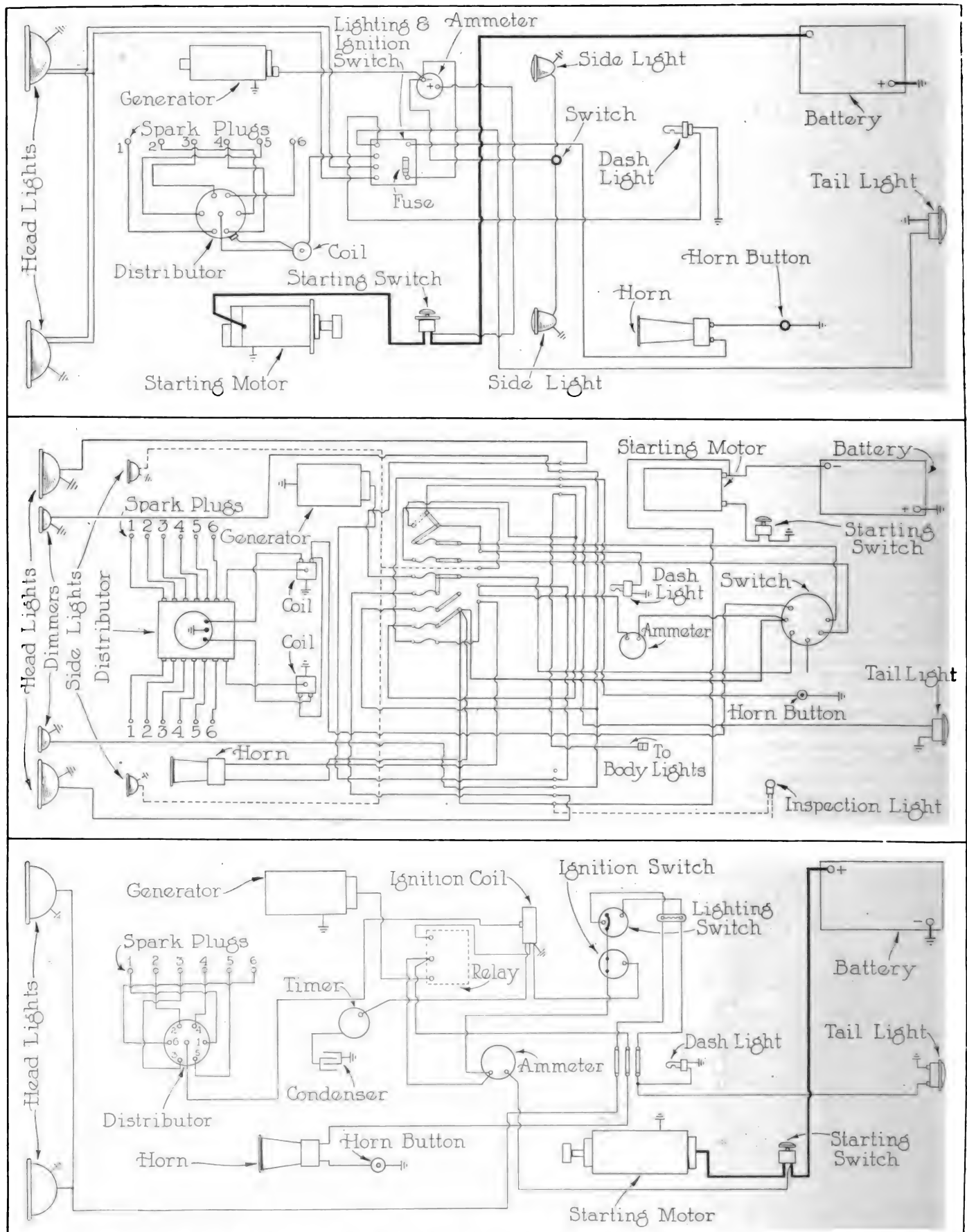
The device is known as the Hankee signal and it is manufactured by the Hankee Electric Manufacturing Co., 3330 University avenue, south east, Minneapolis, Minn. It is especially designed for use on open or closed passenger cars and motor trucks. This signal device has been thoroughly tested by the manufacturer for the past two years and the results of these tests amply prove the claims made for it.

The company states that to date approximately 25,000 Hankee signals have been manufactured and sold and that, through the middle west and on the Pacific coast it has become very popular, as it answers the requirements of police departments in practically all of the larger western cities and is also being used by fire departments extensively as standard equipment for fire apparatus. The police departments of many of the larger Pacific coast cities, including San Francisco and Los Angeles, have also approved of this method of signalling and advocate its general use.



Showing Manner by Which Hankee Signal Is Operated from a Small Electric Motor in Each Arrow, Which Takes Current from the Storage Battery.

Monthly Wiring Diagram, No. 22



Top—Pulse Model 15-19, 6-42 and 17-20-6-66 Using Atwater Kent Ignition, Remy Starting and Lighting or Gray & Davis Separate Switch for Side Lamps. Center—Packard Twin-Six 1917, '18, '19 Delco Ignition Bijur Two-Unit Starting and Lighting System. Bottom—Reo Models T-Six and U-Six, 1920-'21 Northeast Two-Unit Starting-Lighting Systems, Battery Ignition.

Automobile Salon Brilliant Event

Aristocracy of Motordom Views Display of American and Foreign Cars Including the Finest from Both Continents.

WHAT was undoubtedly the largest assemblage of the world's finest motor cars ever gathered in this country was on exhibition at the 17th annual Automobile Salon, which opened at the Commodore hotel, New York City, Sunday night, Nov. 27. Thirty makes of high-grade motor cars representing England, France, Belgium, Italy, Germany and the United States, and custom-built bodies designed by the prominent manufacturers of three European capitals and a half score of American cities disclosed practically all that is new and fashionable in the aristocracy of motordom.

Last year's Automobile Salon set a new record for the number of exhibits, yet the exhibition opening Sunday night was 50 per cent. greater. Thus was attested the fast growing vogue of the fine motor car and custom body and the success of the annual salon. There were exhibits at this salon in the main lobby and mezzanine balcony of the Commodore, as well as throughout the entire ball room floor.

The following cars were on exhibition: Benz, Biddle, Brewster, Cadillac, Cunningham, Daniels, Dorris, Duesenberg,

Falcon, Fergus, Flat, Hispano Suiza, Isotta Fraschini, LaFayette, Lanchester, Lancia, Lincoln, Locomobile, McFarlan, Mercedes, Minerva, Packard Twin Six, Pierce-Arrow, Rauch & Lang, Richelieu, Rolls-Royce, Spa, Stevens-Duryea, Sunbeam, Winton.

Special custom coach work exhibits were made by the following American body builders: Brewster, Brooks-Ostruk, Clarke D. Pease, De Causse, Derham, Fleetwood, Healey, Holbrook, Locke, New Haven, Rochambeau, Walter M. Murphy, Smith Springfield.

All that is meritorious in accessories, fittings and equipment was found on the various complete cars exhibited. Included were latest fabrics in cloth and leather upholstery materials which have become so important a feature of the fine motor car. Beautifully grained imported leathers, attractively woven broad cloths from the looms of old Normandy and rarely spun tapestries from the Orient were predominant among the upholstery materials used. Fashionable color effects, including a new variable color which changes under different lighting, proved a real attraction.

Other New Mechanical Features.

Among a number of other new mechanical features which the salon disclosed was the distillator on the Dorris, a device which makes practical the use of low-grade fuels in the standard type gasoline motor. A distinctively new type of car introduced was the Falcon, which belongs to the light car or "1½-litre" class that gained marked popularity abroad during the past year. This can be described as a miniature of the standard types of big cars and proved of real interest to salon visitors.

For a majority of those who own high-priced motor cars and therefore visited the salon, the principal interest centered in the magnificent examples of the coach makers art. In styles and designs, in fittings and upholstery, and in color effects, the custom bodies at this season's exhibition established new standards of excellence. In the design of running boards, fenders and lamps, the creators of body styles have evolved new ideas which are both astonishing and pleasing.

The salon will be repeated at Chicago, Jan. 28 to Feb. 4.

Many Thousands Visit Western Wonderland

THE progress of the descendants of the Pilgrim Fathers is keeping pace with their pioneering traditions and accomplishments, judging from the many automobile license tags of states in the New England group that were noted during the recent travel season in the Rocky Mountain national park, in Colorado. This meant pioneering of a new sort. It presaged the day when a 5000-mile automobile trip will become a popular cross-country diversion, Rocky Mountain national park being the most centrally located of the people's playgrounds in the United States.

Virtually all the 273,737 persons who visited Rocky Mountain national park during the 1921 travel season, both by train and automobile, through Denver, the "Gateway City," also motored through the Denver mountain park system. This municipal playground of 4000 acres of wood land and crag and snow-swept heights begins 12 miles from the city and contains unsurpassed mountain drives and camping facilities. It was visited by 600,000 autoists during the summer.

Travellers from many states are playing an important part in the increased patronage, year after year, in their own—the people's—playgrounds. Rocky Moun-



Scenes Such as This Are Common in Denver's Municipal Play Ground, Which Embraces 4000 Acres of Scenery Unsurpassed in Any Other Part of the World.

tain park, for example, had 100,573 more visitors than the combined total registration of 173,164 people for Yellowstone

and Yosemite national parks, and increased its own record over 1920 by 32,771 more people in 1921.

Calendar of Conventions and Exhibitions

Dec. 6-8—Chicago, Ill., Second Annual Meeting, American Petroleum Institute, Congress Hotel.

Dec. 6-9—Stout Falls, S. D., Annual Convention, South Dakota Implement Dealers' Association; Exhibition of Farm Machinery Held in Connection.

Dec. 13-15—Peoria, Ill., Convention, Illinois Implement & Vehicle Dealers' Association; Secretary, W. L. Derry, Vermont, Ill.

Dec. 13-16—Columbus, O., Fifth Annual Convention and Exhibit, Ohio Automotive Trade Association, Memorial Hall.

Dec. 22—Philadelphia, Pa., Sectional Meeting, Society of Automotive Engineers.

Dec. 23—Detroit, Mich., Meeting, Society of Automotive Engineers.

Dec. 27-29—Chicago, Ill., Convention, American Society of Agricultural Engineers, Auditorium Hotel.

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Jan. 4-6—Omaha, Neb., Convention and Exhibition, Mid-West Implement Dealers' Association; Secretary, James Wallace, Council Bluffs, Ia.

Jan. 7-13—New York City, National Automobile Show, National Automobile Chamber of Commerce, Madison Square Garden.

Jan. 9-14—New York City, First National Automobile Body Builders' Show, Automobile Body Builders' Association, 12th Regiment Armory; Passenger and Commercial Bodies, Materials and Parts.

Jan. 9-20—New York City, First Annual Retail Dealers' Auto Equipment Show, Hotel Imperial, National Retail Merchants' & Buyers' Association; Accessories and Automobile Clothing; George T. Keen, Secretary, Hotel Imperial.

Jan. 10-12—Minneapolis, Minn., Convention, Minnesota Implement Dealers' Association; Secretary, C. I. Buxton, Owatonna, Minn.

Jan. 11-14—New York City, Annual Meeting, Society of Automotive Engineers.

Jan. 12-22—Oakland, Cal., Motor Car Show, Alameda County Automobile Trade Association, Auditorium; Manager, Robert W. Martland.

Jan. 13—Newton, Mass., New England Sectional Meeting, Society of Automotive Engineers, Plant of Stanley Automobile Co.

Jan. 14-20—Cleveland, O., Automobile Show, Cleveland Automobile Manufacturers' & Dealers' Association.

Jan. 14-20—Buffalo, N. Y., Automobile Show, Buffalo Automobile Dealers' Association.

Jan. 17-19—Kansas City, Mo., Convention, Western Retail Implement, Vehicle & Hardware Association; Headquarters, Coates House; Sessions in Century Theater; H. J. Hodge, Secretary, Abilene, Kan.

Jan. 17-20—Spokane, Wash., Convention, Pacific Northwest Hardware & Implement Association, Davenport Hotel; E. E. Lucas, Secretary, Hutton Building, Spokane.

Jan. 17-20—Chicago, Ill., Convention, American Road Builders' Association.

Jan. 19-25—Milwaukee, Wis., Annual Automobile Show, Milwaukee Automotive Dealers' Association, Auditorium; Passenger Cars, Trucks and Accessories; Bart J. Ruddle, Manager, 316 Brumler Building.

Jan. 21-24—Cleveland, O., Show, Cleveland Automobile Manufacturers & Dealers' Association, City Exposition Building; Manager, Fred H. Caley.

Jan. 23—Milwaukee, Wis., Annual Meeting, Wisconsin Automotive Dealers' Association.

Jan. 23—Montgomery, Ala., Annual Meeting, Alabama Automobile Dealers' Association; James B. Farley, Secretary, Montgomery.

Jan. 23-29—Portland, Ore., Annual Automobile Show.

Jan. 24—Detroit, Mich., Sectional Meeting, Society of Automotive Engineers.

Jan. 24-26—St. Louis, Mo., Convention, Mississippi Valley Implement & Hardware Association; Secretary, F. E. Goodwin, Kirkwood, Mo.

Jan. 24-26—Dallas, Tex., Convention, Texas Hardware & Implement Association; Secretary, A. M. Cox, Dallas.

Jan. 24-26—Denver, Col., Convention, Mountain States Hardware & Implement Association; Secretary, W. W. McAllister.

Jan. 24-27—Louisville, Ky., Convention and Exhibition, Kentucky Hardware & Implement Dealers' Association; Secretary, J. M. Stone, Sturgis, Ky.

Jan. 24-27—Portland, Ore., Convention, Oregon Retail Hardware & Implement Dealers' Association, Imperial Hotel; E. E. Lucas, Secretary, Hutton Building, Spokane, Wash.

Jan. 25-27—Fargo, N. D., Convention and Exhibition, North Dakota Implement Dealers' Association; Secretary, R. A. Lathrop, Hope, N. D.

Jan. 28—Worcester, Mass., Passenger Car Show, Worcester Automotive Association, Casino.

Jan. 28-Feb. 3—Chicago, Ill., Automobile Salon.

Jan. 28-Feb. 3—Chicago, Ill., National Automobile Show, National Automobile Chamber of Commerce, Coliseum.

Jan. 30-31—Chicago, Ill., Fifth Annual Convention, National Automobile Dealers' Association, La Salle Hotel.

Jan. 30-Feb. 4—London, Ontario, National Motor Show of Western Ontario, Ontario Automotive Retailers' Association.

Jan. 30-Feb. 4—Scranton, Pa., 12th Annual Passenger Car Show, Scranton Motor Trades Association, Armory; Passenger Cars, Trucks, Tractors and Accessories. Hugh B. Andrews, Manager, 411 Board of Trade Building.

Jan. 31-Feb. 2—Chicago, Ill., Annual Meeting, Automotive Electric Service Association, La Salle Hotel.

Jan. 31-Feb. 2—Lincoln, Neb., Convention, Nebraska Retail Hardware Association; George H. Dietz, Secretary, 411-417 Little Building, Lincoln.

Feb. 3-10—Minneapolis, Minn., 15th Annual Automobile Show, Minneapolis Auto Trade Association; Passenger Cars, Trucks and Accessories; W. R. Willmot, Manager, 709 Andrus Building, Minneapolis.

Feb. 6-9—Scranton, Pa., Annual Truck Show, Scranton Motor Trades Association, Armory; Hugh B. Andrews, Manager, 411 Board of Trade Building.

Feb. 6-11—Winnipeg, Manitoba, Canada, Second Annual Automotive Equipment Association, Board of Trade Auditorium. Secretary, W. L. Williams, New Stovel Building, Winnipeg.

Feb. 6-11—Minneapolis, Minn., Seventh Annual National Tractor Show and Educational Exposition, National Implement & Vehicle Association, Minneapolis State Fair Grounds.

Feb. 7-10—Oklahoma City, Okla., Convention and Exhibition, Oklahoma Implement & Hardware Association; Secretary, W. B. Porch, Oklahoma City.

Feb. 7-10—Grand Rapids, Mich., Convention and Exhibition, Michigan Retail Hardware Association; Karl S. Judson, Exhibits Manager, 248 Morris Avenue, Grand Rapids; A. J. Scott, Secretary, Marine City, Mich.

Feb. 8-10—Milwaukee, Wis., Convention and Exhibition, Wisconsin Retail Hardware Association; P. J. Jacobs, Secretary, Stevens Point, Wis.

Feb. 9-16—Kansas City, Mo., Kansas City Motor Car Dealers' Association.

Feb. 11-18—San Francisco, Cal., Sixth Pacific Automobile Show, Motor Car Dealers' Association of San Francisco, Exposition Auditorium; Passenger Cars, Trucks, Tractors and Accessories; G. A. Wahlgreen, Manager, 215 Humboldt Bank Building.

Feb. 12—Madison, Wis., Ninth Annual Show, Automobile Dealer Division, Association of Commerce; Passenger Cars, Trucks and Accessories; Don W. Mowry, Manager, Cartwell Building.

Feb. 14-16—Chicago, Ill., Convention, Illinois Retail Hardware Association, Hotel

Sherman; Leon D. Nish, Secretary, Elgin, Ill.

Feb. 14-17—Philadelphia, Pa., 21st Annual Exhibit and Convention, Pennsylvania & Atlantic Seaboard Hardware Association, Inc., Commercial Museum; Automobile Accessories, Etc.; Sharon E. Jones, Secretary, 1314 Fulton Building, Pittsburgh.

Feb. 14-17—St. Paul, Minn., Convention, Minnesota Retail Hardware Association; H. O. Roberts, Secretary, 1030 Metropolitan Life Building, Minneapolis.

Feb. 18-25—Albany, N. Y., Automobile Show, Automobile Dealers' Association, State Armory.

Feb. 20-25—Syracuse, N. Y., Passenger Car Show, Automobile Dealers' Association, State Armory.

Feb. 20-25—Deadwood, S. D., 10th Annual Black Hills Auto Show, Deadwood Business Men's Club, Auditorium; Passenger Cars, Trucks, Tractors and Accessories.

Feb. 20-25—Duluth, Minn., Seventh Annual Show, Duluth Auto Trade Association, Duluth Armory Building; Passenger Cars, Trucks, Tractors and Accessories.

Feb. 20-25—Louisville, Ky., 14th Annual Automobile Show, Jefferson County Armory; Passenger Cars and Accessories; George T. Holmes, Inter-Southern Building.

Feb. 21-24—Mitchell, S. D., Convention and Exhibit, South Dakota Retail Hardware Association; H. O. Roberts, Secretary, 1030 Metropolitan Life Building, Minneapolis, Minn.

Feb. 23—Philadelphia, Pa., Sectional Meeting, Society of Automotive Engineers.

Feb. 21-24—Des Moines, Ia., Convention and Exhibition, Iowa Retail Hardware Association; Exhibition in Coliseum; A. R. Sale, Secretary, Mason City, Ia.

Feb. 24—Detroit, Mich., Meeting, Society of Automotive Engineers.

Feb. 26-March 3—Des Moines, Ia., Winter Automobile Show.

Feb. 27-March 2—Bethlehem, Pa., Seventh Annual Truck Show, Bethlehem Auto Trade Association, Coliseum; Trucks, Tractors and Accessories; Manager, J. L. Elliot, 1308 Norway Place.

Feb. 27-March 4—Springfield, Mass., Seventh Annual Automobile Show, Springfield Automotive Dealers' Association.

Feb. 27-March 4—Atlanta, Ga., Second Annual Great Southern Automobile Show, Atlanta Automobile Association, Auditorium Armory; Passenger Cars, Trucks and Accessories; Virgil W. Shepard, Manager, 305 Connolly Building.

Feb. 27-March 10—London and Birmingham, England, British Industries Fair.

Feb. 28-March 4—Wichita, Kan., Accessory Show, Wichita Motor Trade Association, Exposition Building.

March (first week)—Lewistown, Mont., Convention, Montana Implement Dealers' Association; Secretary, J. E. Owens, Lewistown.

March 4-11—Brooklyn, N. Y., 11th Annual Show, Brooklyn Motor Vehicle Dealers' Association.

March 7—Dayton, O., Sectional Meeting, Society of Automotive Engineers; Speaker, Captain Lorenzo L. Snow.

March 11-18—Newark, N. J., Automobile Show, Newark Automobile Dealers' Association.

March 11-18—Boston Show, Mechanics' Building.

March 23—Philadelphia, Pa., Sectional Meeting, Society of Automotive Engineers.

March 24—Detroit, Mich., Meeting, Society of Automotive Engineers.

April 27—Philadelphia, Pa., Sectional Meeting, Society of Automotive Engineers.

April 28—Detroit, Mich., Meeting, Society of Automotive Engineers.

May—Trenton, N. J., Annual Convention, New Jersey Automotive Trade Association; Secretary-Treasurer, H. S. Moore, Trenton.

May 16-19—Chattanooga, Tenn., Convention and Exhibition, Southeastern Hardware and Implement Association (Alabama, Florida, Georgia, Tennessee); Secretary, Walter Harlan, Jacksonville, Fla.

ACCESSORIES DEPARTMENT

The Casco Hold 'Em in the Road is designed to do away with six objectional features said to be present sometimes in the Ford car. In the first place as the Hold 'Em in the Road is an axle support, and acts as a stabilizer, it makes the car easier to steer and safer to drive. Second, it functions as a brace bar, preventing the breaking of the radius rod. A broken radius rod is a dangerous possibility, and may mean a wrecked car and possibly injury or death. Third, it eliminates wear on the tires by compelling the car to travel in a straight line. It is the constant zig-zag that brings on excessive friction and therefore causes greater wear on the tires. Fourth, as it acts as an anti-rattler, it eliminates the rattling of parts on the front axle, which is so wearing on the nerves. Fifth, it prevents wear on all parts of the front axle and steering gear. The constant giving out of cones, spindles, ball bearings, bolts, etc., is an item of expense that should merit

vice is once locked in the radiator it cannot be unfastened and the only way to remove the Moto Meter is by loosening the set screw with the special wrench supplied by the manufacturer and then the Moto Meter can be separated from the

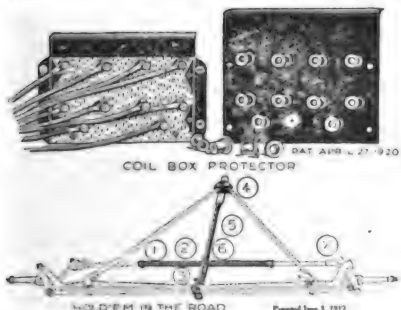
the low-speed band which hardens it and often causes the car to start with a leap, with the consequent danger of tearing out the gears, breaking axles, twisting the drive shafts off, tearing tires to pieces or causing other damage and expense.

With the E-Z-4-U pedal grip all that is necessary is to step on the pedal in the usual way and the pedal stays set after a positive neutral stop when coasting down a grade or when the motor is running idle. This eliminates friction as the foot is taken away. And in order to free the pedal all that is needed is a slight pressure with the foot at the bottom of the pedal.

The E-Z-4-U pedal grip is not bulky, is simple in construction, has no ratchet device, weighs but two pounds and can be installed by anyone in 10 minutes as it requires no change in the car.

Manufactured by the H. S. Custer & Sons Manufacturing Co., Stoyestown, Pa. Prices on request.

The Master Engine Stand is stated to greatly facilitate repair work in garage, repair shop or service station. Three positions are easily obtained with the stand herewith illustrated. It is so designed that it is counterbalanced at any position by a spring of suitable tension. By means of the release lever operated by the foot the workman can execute these changes of position with one hand and the mini-



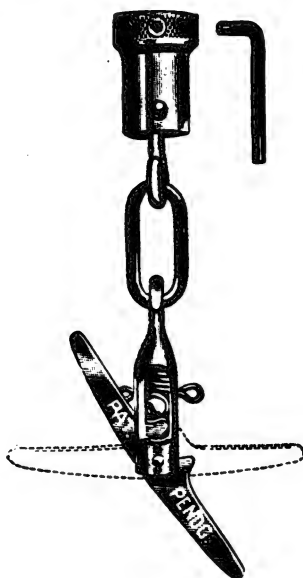
careful consideration. Sixth, it does away with insecurity. The feeling that the driver is amply protected adds greatly to the pleasure of operating a car.

The Casco Trouble Coil Box Protector is also shown herewith. It affords immunity against the bad effects of rain or snow, is rubber insulated and impossible to short circuit.

Both of these devices were formerly manufactured by the Casco Manufacturing Co., but were recently acquired by the Dow Wire & Iron Works, Franklin, Buck: non and Pocahontas Streets, Louisville, Ky.

The Lee Motor Meter Lock is designed to prevent the theft of the Moto Meter. It is guaranteed not to interfere in any way with the function of the regular Moto Meter equipment and is claimed to be the only positive locking device for this purpose on the market. As will be noted from the cut, there is a link connecting the tube part of the lock to the nozzle that is attached to the Moto Meter and this link adapts the lock so as to fit any radiator spout. Where there is a short spout, as on the Dodge car, the link allows the lock to double back so that the cap can be screwed on without trouble. The lock is also Parkerized, making it rust-proof.

The little wrench seen in the cut is for tightening the set screw after the lock is placed on the Moto Meter. When the de-

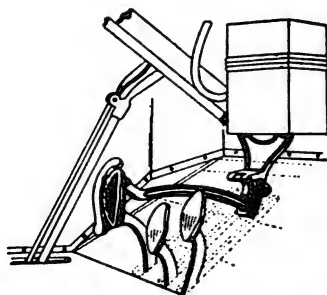


lock. The lock, however, will always stay in the radiator.

The Lee motor meter lock is designed for Boyce Moto Meters. To install, attach the lock to the Moto Meter, insert in the radiator spout and pull up. This operation can be performed by anyone in one minute and no adjustments are necessary. The Lee motor meter lock is made of steel, brass and copper, nickel plated.

Manufactured by the Lee Manufacturing Co., Ann Arbor, Mich. Sales department, Frank M. Lottridge Co., 620 Consumers' Building, Chicago, Ill. Prices and literature on request.

The E-Z-4-U Pedal Grip, Model 21, is designed to relieve the strain of keeping the foot continually on the clutch pedal when climbing a long hill. It also acts as



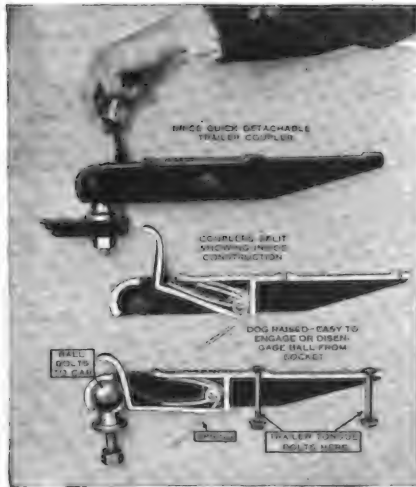
mum of effort. The heads are built so that they are interchangeable, this being done by simply loosening two set screws, thus changing in a few minutes from a Ford to a Fordson stand.

Manufactured by the Reschke Machine Works Co., 908 North Washington Avenue, Wichita, Kan.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

The Brice Automatic Coupler is a ball-and-socket device, which has been designed along correct mechanical principles, especially for coupling light trailers, or boat trailers, to light trucks or automobiles. A lever on the top of the coupler bar locks the coupler in position for use, while raising the lever unlocks the coupler when not in use.

It is claimed that the coupler will not rattle as the locking dog is held in position with a spring which prevents the

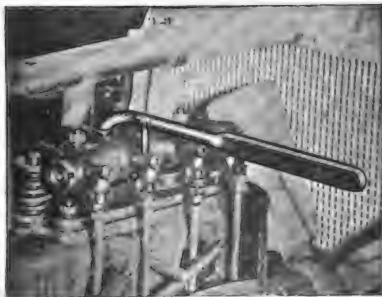


side movement of the locking device. The coupler is quickly and easily attached in a few minutes time by anyone handy with tools and becomes a part of the towing truck.

Manufactured by the Brice Automatic Coupler Co., 1408-10 Hennepin Avenue, Minneapolis, Minn.

The J. & B. Rocker Arm Lifter is designed to be used in conjunction with the valve cage remover for the purpose of lifting the rocker arm clear from the ball end of the push rod, allowing the push rod to be sprung out of place, and the rocker arm to be revolved about its axis away from the valve stem, giving free access to the valve spring cage.

A wheel puller and bushing remover are also manufactured by the same company, which offer two useful devices for the re-



moval of stubborn wheels or bushings. They are simple in construction, easily attached for use and do their work with ease.

Manufactured by the J. & B. Manufacturing Co., Pittsfield, Mass. Retail prices: Rocker Arm Lifter, \$2.50; Valve Cage Remover, \$5; Wheel Puller, \$5; Bushing Remover, \$1 each.

The HusKee Combination Drill and Valve Grinder is claimed to be a tool that will at once fill a want of long standing in the service station, garage and repair shop in that it is capable of performing more than one service. Thousands of shops will require no other power plant than this HusKee Three-in-One service

tool. This has a drilling capacity up to five-eighths of an inch in steel; 1 1/4 inches in wood. It will handle any valve grinding job from a motorcycle to the largest truck or tractor. It may be used either as a stationary or portable tool for light emery grinding.



The construction of the HusKee Three-in-One service tool is identical in every way with that of the well-known HusKee electric drill, only a device has been added whereby there is combined in the one tool the oscillating (forward and back) motion of the valve grinder as well as the rotary motion necessary in a drill. To change from a drill to a valve grinder all that is necessary to be done is to unscrew the drill chuck and slip on the valve grinder sleeve.

Equipment is supplied complete as shown in the cut; Universal motor for either direct or alternating current; can be plugged in on any lamp socket. The regular stock equipment is adapted for 110-volt; optional, 32 or 220.

Manufactured by the Worcester Electrical Tool Corporation, Worcester, Mass. Those interested are invited to write concerning trial offer. Sold through regular jobbers in auto accessory, hardware and electrical supply stores.

The Diamond Steel Roller Drive Chains for motor trucks, industrial drives, bicycles, motorcycles, etc., offer the trade a positive power transmission having accurate control with no possibility of slippage. They efficiently transmit power, it



is claimed, under favorable conditions as high as 98 per cent. All shock absorbing strains are taken up in the chains and their long life makes for economy and uninterrupted service.

Manufactured by the Diamond Chain and Manufacturing Co., Indianapolis, Ind.

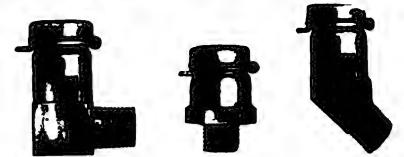
The Empress High-Pressure Lubricating System is adapted to practically all motor trucks and passenger cars with a special equipment for Ford cars and trucks. The device consists of a high-pressure cylin-



(When Writing to Advertisers, Please Mention the Automobile Journal.)

der containing the lubricant, which is operated by hand, and special nipples which are screwed into the various grease cup openings on the chassis of the truck or car. The grease is forced through the nipple at the end of the gun into those on the chassis bearings with sufficient pressure to force out all the old oil and dirt, supplying fresh lubricant for the bearings.

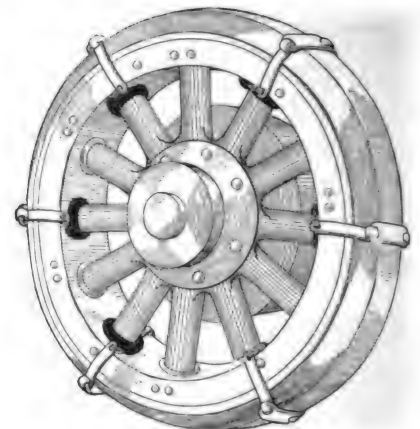
The system is low in cost and easily installed by anyone in a few minutes' time by simply removing the old nipples or compression grease cups and screwing in



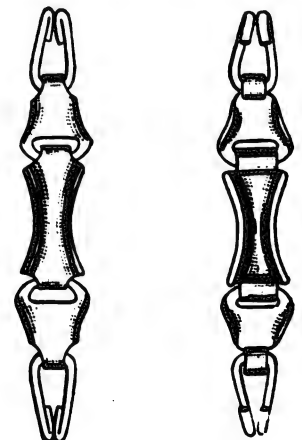
those which come with the system. Covers fit over the tops of the nipples, preventing the entrance of dust or grit.

Manufactured by the Bowen Products Corporation, Auburn, N. Y.

Easylon and Double-Grip Tire Chains are a new and improved type of traction chain which have special features which recommend their use for both pneumatic and solid tires on motor trucks. The cross



members resting on the tread of the tire have a rounded smooth surface adjacent to the tire to prevent injury. The chains vary in width from one to two inches and are comparatively thin. On pavements or smooth surfaces where there is no tendency for the wheels to slip the chains lie flat and prevent bumping. When slipping



starts, however, the pull on the rear edge of the cross member tips up the front edge, causing it to dig in and take a very strong hold, preventing further slipping and supplying traction on slippery road surfaces.

The Easylon chains are fastened to the spokes with leather-covered retainers.

Manufactured by the Woodworth Specialties Co., Binghamton, N. Y.

The K-M Windshield Cleaner is a distinctively different type of mechanical windshield cleaner, that will fit any type of windshield on any car manufactured, in any desired position and at the same time is designed to be sold at a moderate cost. It is claimed by the manufacturer that the purchaser has the choice of interchangeable wipers of three distinct types, rubber, felt or spring brass.

The spring brass wiper is designed for use on the outside glass, the thin spring blades, cutting in the direction of movement, actually getting under and remov-



ing ice, sleet and frost instead of merely dragging over such obstructions. The spring brass blade wiper is used in combination with a felt wiper on the inside of the glass.

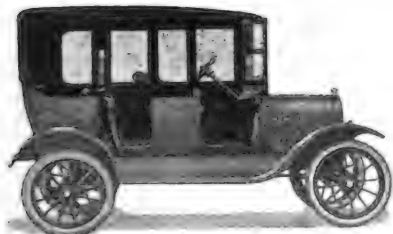
Where felt only is desired an especially thick felt pad is made for the outside of the glass and is used in combination with a thinner felt wiper for the inside of the glass. The felt wipers are chemically treated and, it is claimed, one wiping will prevent the rain and other moisture from forming in beads, but causing the same to run off and leave the glass clear during the entire storm.

The rubber wiper can be used with the felt wiper in any desired combination, or rubber wipers can be provided for both sides of the glass. It is also claimed by the manufacturer that purchasers will never have to repurchase an entire new windshield cleaner with K-M's, because the interchangeable wipers are the only parts that will ever need replacement and they are not only replaced quickly and easily, but at a very low cost.

Manufactured by the K-M Manufacturing Co., Toledo, O. Prices on request.

Faultless Tops for Ford and Dodge cars are easily installed and furnish sedan comfort for the touring car owner at a great saving in price. They are well built of high-grade material and will stand up and give years of service.

Faultless tops are neatly painted in black, upholstered with gray cloth, and



present a very attractive appearance. Good ventilation is furnished by lowering the upper glass in the doors. There is no squeak or rattle to the Faultless top. The car door and top door open as one, and the original windshield is used.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

The prices on Faultless tops were recently reduced so that they are now reported to be far below pre-war quotations. They are now being sold direct from the manufacturer to dealer, thus cutting out jobber's profit.

Manufactured by the American Auto Top Co., Delphi, Ind.

The Standard T-55 Five-Gallon Curb Pump is stated to be the latest, right up to the minute equipment, affording the motorist quick and accurate and, therefore, satisfactory service—that will turn



first buyers into steady customers. With the gasoline stored in a conveniently located Gilbert & Barker underground tank and dispensed through a positive stroke, piston type, self-measuring pump, both of which have been examined and approved by the Underwriters' Laboratories, the gasoline dealer is assured of the safest, cleanest and most efficient means of handling his trade.

One full stroke of the piston delivers five accurate gallons in 20 seconds. Lesser quantities of four, three, two, one or one-half gallons may be accurately delivered by setting quantity stops for the desired amount. A graduated scale on the front of the pump shows the customer exactly how much he is getting. Each measurement is controlled mechanically and may at any time be tested and sealed by the local sealer of weights and measures.

The T-55 pump, when operated by compressed air, is an outfit unexcelled in service. By means of a pressure reducing valve the air is regulated to just the proper amount to operate the pump quickly and efficiently. The entire operation may be controlled by one finger of the operator. The saving in labor by the air-operated pump makes it especially desirable in filling stations where many customers are handled daily. In addition to its value as an efficient dispenser of "gas" the attractive appearance of the T-55 with illuminated globe serves as an effectual advertisement for its owner.

The standard pump, No. T-55, shown herewith, includes the following equipment: Five-gallon self-measuring pump, machine-cut racks and gears, graduated indicator scale, visible quantity stops, automatic discharge meter, hose and curved nozzle, quick release and automatic return handle, electric lighting arrangement,

locks on driving shaft cover and doors, pump finished in weather-resisting, red enamel, baked on. Approximate shipping weight, 650 pounds.

Manufactured by the Gilbert & Barker Manufacturing Co., Springfield, Mass. Full particulars on request.

The Directo Stop Signal is, as its name indicates, not merely a stop signal, but directs the way the driver is going as well. The stop part of the signal is controlled by the brake or clutch or both and the right and left direction is con-



trolled by an electric switch attached anywhere desired. By simply pushing a button the driver behind is told the direction the car in front is expected to turn. It is said to be easily installed and fits any car.

The Directo is now being sold in Cleveland and Chicago and in one or two other territories and the company is supplying new jobbers and dealers as fast as production will permit. Complete sales policies have been carefully worked out.

Manufactured by the Hitchcock Tool & Die Co., 1362 East Third Street, Cleveland, O.

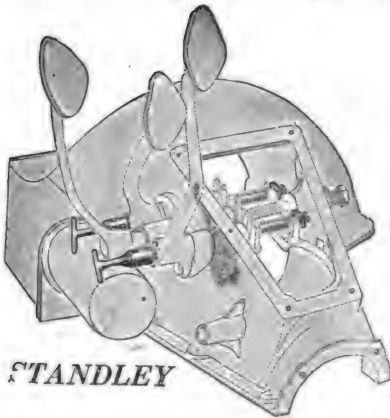
The Mayhew Punch Assortment, No. 400, forms a very handy equipment for repair shops and service stations and garages. It contains two dozen embossed hand-



forged, electrically tempered, steel punches, consisting of eight solid, four center, two prick and 10 pin punches of 1/4-inch and 13/32-inch bodies and assorted lengths.

Manufactured by Mayhew Steel Products, Inc., 291 Broadway, New York City. Price, \$8.20; packed in a neat wooden box.

The Standley Transmission Band Adjuster is claimed to be one of the most important improvements ever made to the Ford car. It allows the adjustment of the brake and transmission band without removing the cover of the case. A simple turn of the handle tightens or loosens the bands. It can be easily installed by the novice as no changes are necessary to the transmission case and the work can be performed in practically the same time



Style "A" for transmissions without starter attachment



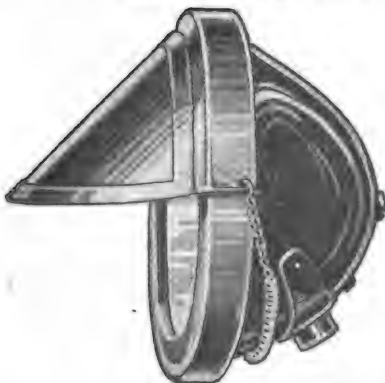
Style "B" for transmissions with starter attachment

as that required to adjust the bands by the old method. When installed the brakes can be adjusted in a few seconds to any tension desired.

The Standley transmission band adjuster is constructed of cold rolled steel, perfectly machined to fit in place of the bolts used to hold the pedals and transmission bands.

Manufactured by the Standley Skid Chain Co., Boone, Ia. Further information on request.

The Patton Glare Stop is a patented device that is placed on the head lights of the automobile, and comes in sizes to perfectly fit any make of car. It is made of cathedral glass in a metal frame, rounded to fit the segment of the lamp and held firmly in place by a steel wire spring that allows it to be positioned at any angle desired, preferably five degrees. It forms a shade or hood from the light up and intercepts all glare that would ra-



diate horizontally or upward. The rays are thrown directly on the road for 100 feet ahead, lighting it so thoroughly that the driver can see clearly every rut or hole as plainly as when driving in the day time. It concentrates all the light on the road.

It is stated also that Patton Glare

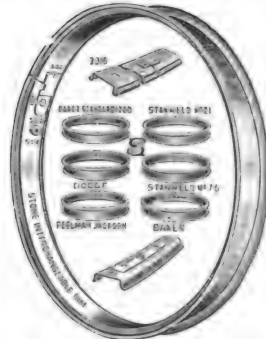
(When Writing to Advertisers, Please Mention the Automobile Journal.)

Stops comply with the law, protect lenses from rain and snow, prevent accidents in night driving and "dress up" the car, giving a distinctive appearance.

For sale by the Universal Motor Products Co., 306 Jacobson Building, Denver, Col. Prices on request.

The Stone Interchangeable Rim is stated to be a standard rim which interchanges with eight makes of rims used on popular cars, without changes of any kind, as follows: Kelsey Nos. 20 and 30; Baker Standardized; Stanweld Nos. 21, 22 and 76; Dodge Special; Baker; Detroit; Perlman-Jackson. The Stone Interchangeable rim fits perfectly on the felloe bands of all these makes of rims. The projections and embossings usually found on felloe bands need not be hammered down. No change of wedges is necessary.

It is stated that there is nothing about this rim which might make its practicability doubtful. The lock is of the ap-



proved standardized type with the well-known Baker angle split, which makes tire changing easy. The valve stem passes through a 13/16-inch dowel drive which, when fitted into the felloe band, makes creeping impossible.

Manufactured by the Stone Manufacturing Co., 1502 South Michigan Avenue, Chicago, Ill. Prices on request.

The New Miller Rim Tool, the maker states, will open or close any split rim with one move of the hand, will return and hold the rim ends in exact position for relocking, and will operate a stiff, sprung or rusty rim no matter how bad. The accompanying cut shows the tool in use with the rim partly contracted. This device grips both sides of the rim at the



split, thus causing an even contraction. It consists of a single piece with a detached handle, both of malleable iron, and has no moving parts, gears, racks or turnbuckles. Three sizes provide for all widths, diameters and makes of rims.

Manufactured by Miller Brothers, Inc., 910 First National Bank Building, Chicago, Ill. Prices on request.

The Hart-Bell Truck and Tractor Jack is a new type employing the double-screw principle. It is claimed to be invaluable for use in soft ground as the second screw allows for shrinkage. The No. 5 jack, as shown, has a lifting capacity of five tons



and weighs but 12 pounds. It is 9 1/4 inches high and will raise the axle 10 inches, or a total of 19 1/4 inches. The handle is in two sections, each 9 1/4 inches long.

Manufactured by the Hart-Bell Manufacturing Co., 1926 Broadway, New York City. Price, \$13; west of the Rockies, \$13.50.

Peerless Speed Band Liquid, a liquid that stops the grabbing, jerking, jarring, shaking and shimmying of Ford cars, is a new product recently added to the line of Peerless automobile specialties. After thorough study it has been found these unnatural tendencies are all caused by the speed bands becoming glazed through their use on the metal drums and the carbon in burnt motor oil. This liquid contains no alkali or acid or anything injurious to metal or oil or to any part of the car. It is applied to the bands without removing them from the car. It can be done in 15 minutes by any owner, man or woman, and the effects and lasting qualities are as good as a new set of



speed bands. Speed bands are never one-quarter worn out and new speed bands are costly and take considerable time to install. This product permits complete wearing out of each set of bands.

Directions—Drain oil from motor. Unscrew inspection plate over transmission (six screws). Loosen adjustment nuts four or five turns. Raise bands from drums with screw driver. Pour one-fourth can on drums. Work pedals to take up liquid all around. Allow to stand two or three minutes. Use more by same method until can is empty. Readjust nuts. Replace inspection plate and replace old oil, unless new oil is needed. Drive away, starting and stopping smooth. It is necessary to drain the oil so the liquid can get to the whole band, as about half the bands are in oil.

Manufactured by the Columbus Varnish Co., Columbus, O.

The Yankee Cutter, No. 2000, is designed especially for cutting leather belting and brake lining, giving a quick, clean cut,



which prepares the belt immediately for lacing without the necessity of truing with a knife. Belts up to six inches in width and three-eighths of an inch thick are easily and quickly cut with this device.

The power to operate it is secured through a rack and pinion movement actuated by a lever. The bevel and cutting edges of the knives are the result of careful study and experiment for this special line of cutting, insuring durability, clean cutting and ease of operation.

Adjustable guides are provided on the base and frame of the cutter to insure the work lining up at right angles to the knives, when cutting curved or flat belt stick or brake lining. The cutter should be fastened to the floor or bench by means of lag screws in such a manner that tipping is prevented.

Manufactured by North Brothers Manufacturing Co., Philadelphia, Pa. Prices and literature on application.

The "E S C O" Double-Faced Flaring Tool is a new accessory which has been designed for flaring either copper or brass tubing. It is double-faced, self-opening and with one blow gives the proper flare and taper to either copper or brass tubing. It is made in four sizes as follows:

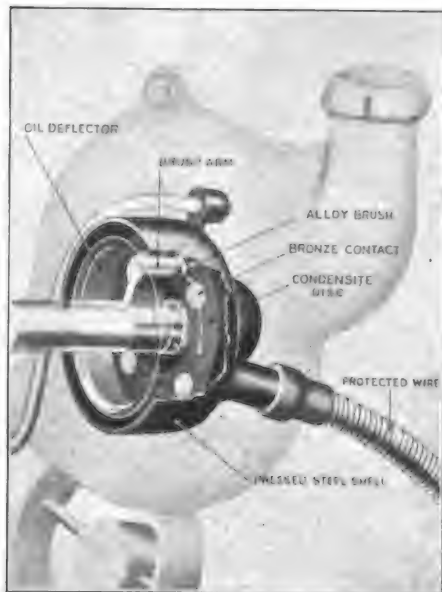


3/16, 1/4, 5/16 and 3/8-inch respectively, and is claimed to flare the tube without the possibility of splitting or cracking.

Service stations find that this device provides a better method of cupping pipe ends and that the possibility of doing a better job and saving time is greatly increased.

Manufactured by the Esco Manufacturing Co., 228 Farnsworth Street, Detroit, Mich. Price, with complete instructions as to use, \$3.25.

The Big "T" Timer for Fordson tractors, Ford cars and trucks, is arranged similarly to a distributor, it is claimed, and should embody the same reliability and permanence. The heavy pressed steel shell is water-tight, solid and indestructible. A thick condensite disc, with bronze contacts moulded in place, is bolted to the shell forming a single unit of shell, wire, conduit and terminals ready for installation. The deflector prevents any oil from working into the timer from the cam shaft bearing at the rear, and the flexible metal conduit with rubber ferrule ex-



cludes water, oil and dirt from the front of the timer, assuring freedom from foul contacts and short circuits. A compression spring provides light tension to hold the special alloy brush in contact with the disc.

The Big T timer is guaranteed to give entire satisfaction, to start the Ford or Fordson engine more easily, and allow it to be throttled lower, run more smoothly, economically and to do these things permanently.

Manufactured by the Fortime Products Co., Warren, O. Price, \$5.

The Bright Star Wash and Towels is a combination liquid wash and paper towels proposition—one of the up-to-date automobile accessories. No matter how soiled with dirt or grease the hands may be, pour a little Bright Star on and it will form a lather the same as the best grade of soap. No water is needed—just pull a towel from the can, dry the hands and



they will be clean and smooth. The liquid in this combination contains no grit and is antiseptic and sanitary. The towels are made of the best material obtainable. When the supply of wash and towels in the can is exhausted, refills are obtainable and easily put into the patented container.

Manufactured by the Bright Star Sales Corporation, 221 North Camac Street, Philadelphia, Pa. This product is marketed through reliable automobile stores, garages, sporting goods dealers, etc. Prices and information on request.

The Ambu Separator Remover is a new tool, marvelous in its simplicity and wonderful in its usefulness, an illustration of which is shown.

Any one who has ever had the job of tearing apart a battery knows how useful this tool will be to slip in between



the plates and the separator, with the teeth side of the blade next to the separator. A pull brings out the separator with the blade.

Manufactured by the American Bureau of Engineering, Inc., 1601-03 South Michigan Avenue, Chicago, Ill.

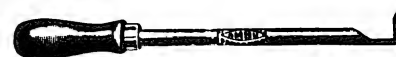
The Nojak is a new device invented by Lynn Beadle of Detroit and is intended to replace the old style automobile jack. It consists of a steel casting weighing about six pounds and is inserted in two small holes bored in the felloe of a motor vehicle wheel. The car or truck owner then simply drives a few feet ahead or back



until the wheel rises on the Nojak. With this device the wheel can be lifted into position for easy tire changing in about seven seconds. Also a Nojak serves as a spare tire guard and a mud or sand hook for driving through heavy roads.

Made by the Commercial Manufacturing Co., 1489 East Fort Street, Detroit, Mich.

The Ambu Battery Box Scraper, shown in the illustration, will be found very useful in removing the compound in battery



boxes, as well as in a dozen other ways in the battery shop. At its low price every battery man will want to have one or two at least.

Manufactured by the American Bureau of Engineering, Inc., 1601-03 South Michigan Avenue, Chicago, Ill.

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Sharpe REG. TRADE MARK ELECTRIC RADIATOR HEATER

This winter, however cold, you can do away with the expense and work of heating your garage, yet have your motor always warm, ready to get away in a second, by using the

Sharpe Electric Radiator Heater

It fastens permanently to the base of radiator and is connected to any lamp-socket with a slip attachment plug. Keeps water warm, oil liquid; prevents oil dilution and drain on battery. **Send No Money.** Just your name and address. Then pay post-man upon delivery, direct-to-user price, \$9.75 for complete outfit. Sold on **Money-Back-Guarantee.** Illustrated folder on request. Send today.



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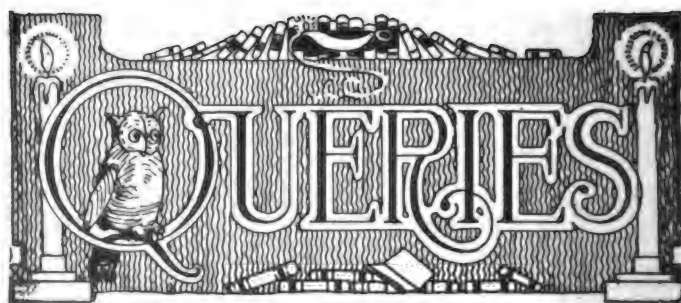
DETROIT APPLIANCES CO., 514 Murphy Bldg.,
Detroit, Mich.

Send me a Sharpe Electric Radiator Heater for which I will pay \$9.75 on delivery, on Money-Back-Guarantee.

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HIGH GEAR RELEASES ON HILLS.

(A. J. G., Baltimore, Md.)

Why does the high gear of my car jump out of engagement when I give the engine gas on a hill?

Your trouble is either that the gear lock does not operate properly or the faces of the high-gear clutch members have become battered and do not stay in place. Better open the transmission housing and inspect these two points. Note if the lever is in the "high" position, that the locking plunger seats securely in the slot and is held strongly positioned by its spring. It may be that you will find the teeth of the direct-drive clutch member so badly roughed up that the teeth will not enter fully or stay in mesh. If the clutch members are in good condition and the lock is properly adjusted, this speed should stay in mesh without slipping out when the engine power is increased for grades.

VERDIGRIS ON BATTERY CONNECTIONS.

(M. B. C., Syracuse, N. Y.)

Two weeks ago my battery was recharged, but last night it would not turn the engine over although the generator was working properly, as indicated by the ammeter. The little use that I make of the lights should be more than compensated for by the amount of day driving that I do. The battery cable connections were found covered with a green substance which I have noticed each time I open the battery to add distilled water. Does the trouble arise from this cause?

Corroded connections caused by a verdigris deposit between the lead of the battery terminal and the lead end of the tire terminal will cause battery failure if the deposit is sufficiently large. A very heavy current is drawn from the battery in starting the engine and a weak current is supplied to the battery from the generator in charging. If this current is prevented from flowing to the battery, failure results, and if the high-rate discharge from the battery is prevented from passing through the high resistance offered by the verdigris deposit, the starting motor will not work properly. Have the terminals of the battery and wire leads cleaned and coat them thoroughly with vaseline inside and out, afterwards drawing the connection tight to prevent further corrosion.

OIL IN WATER CIRCULATION.

(W. S. R., Ludington, Mich.)

What can be the cause of oil getting into the cooling water of my car and what remedy can you suggest? That car has recently been overhauled and runs well in most respects.

A slight crack in the water jacket between the cylinder bore and the jacket would allow oil to enter the water from the cylinder or possibly the oil may be forced back into the water through a leak in the gasket which does not show itself on the outside. The fact that the engine has just been overhauled leads to this as the probable cause.

Possibly the nuts which fasten the head down on the gasket have not been drawn tight enough and should be drawn tighter when the engine is hot. Try this and note if the compression is not improved. Oil in the water circulation system does no particular harm, but if water enters the cylinder through the same leak it should be remedied at once. Sometimes a small leak will rust and eventually stop of itself. If between the contacts is as recommended and they are clean.

The National Auto Shows

Under Auspices of National Automobile Chamber of Commerce, Inc.

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Grand Central Palace
Jan. 7-14.

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Coliseum and Armory
Jan. 28 to Feb. 4.

Two Weeks of Educational Business Uplift

S.A. Miles, Manager.

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CUT-IN SPEED TOO HIGH.

(G. A. H., Milwaukee, Wis.)

My battery will not keep charged because the generator does not cut into the circuit until the car speed reaches 17 or 18 miles an hour. The cut-out coil has coarse and fine windings and I would like to know if I can remove a part of this wire and make the generator cut in sooner. If so how much wire should I remove and from which coil?

Removing turns from the cut-out coil is not advisable. By slightly reducing the strength of the spring that holds the contact apart, earlier cutting-in should be secured, but before making this change you had better be sure that the distance between the contacts is as recommended and they are clean.

HOW TO PAINT A FORD CAR.

(C. F. B., Milladore, Wis.)

Please advise me how to refinish the body and gear of an old Ford car so that it will look as good and keep its luster as long as a new Ford. I refinished my Ford last year, but the finish was not smooth and it turned dull in a short time. Where can I purchase suitable refinishing material?

To get a lasting job of refinishing the old paint should be removed down to the metal. A filling coat is applied, then a coat of primer and followed with the color coat. To have a smooth finish, each coat should be rubbed down, with either steel wool or sea moss, to remove the imperfections of the surface and keep it smooth. After the priming coat has been rubbed down and the color coat applied, this should be rubbed down and followed by a coat of high-grade varnish. Rub this down and apply the second coat of varnish, rubbing down in the same manner. Apply the third coat and, if it is desired to let this stand as the finishing coat, no further rubbing is required. Three or four coats are usually sufficient unless a particularly high-grade job is required. If so, apply further coats of varnish, letting each dry thoroughly before rubbing down.

To remove the old paint from the metal, a paint remover

in the form of a liquid can be obtained from any paint supply house and applied with a cloth, sopping it on to the old paint, later removing what will come off on a cloth and scraping the softened paint from the surface with the flat edge of a putty knife.

The gear is sand papered after all grease and oil have been removed by scraping and soaking with gasoline and the dirt and dust removed with the sand paper and by washing.

When applying the color and varnish coats, have the car in a room free from dust and, if possible, arrange to heat the room if the weather is cold to hasten the drying process. After the car is finished and the parts assembled again, do not run the car until thoroughly dry. If tacky to the finger, spraying a light stream of water over the varnished surfaces will hasten the hardening of the varnish and prevent dust from entering when the car is driven on the road. Two or three sprayings may be required before the varnish is sufficiently dry.

Keep the car, after it is refinished, in a garage free from the fumes of ammonia. If kept in a building where there are horses or other animals the ammonia will attack the varnish, causing it to check and turn yellow.

A low-priced job can be done with enamel and it is possible to do a fair job one day and use the car the next. Smooth finish is sacrificed, however, if the enamel is not applied correctly. It should be flowed on from the bottom, finishing as you go and not going back a few minutes after to touch up a spot that you may have skipped.

Good light is essential in performing either job and sufficient time must elapse between the coats for drying before applying the next.

The best of material should be purchased as this will be found the cheapest in the end. You can buy suitable material from either of the firms mentioned below and they will gladly mail color cards and tell you the nearest point where you can purchase their paints: Sherwin-Williams Co., 601 Canal road, northwest, Cleveland, O.; Valentine & Co., 456 Fourth avenue, New York City.

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30 Church Street, New York
Telephone: Cortlandt 4338

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We are anxious to become so well known that when a man thinks of tanks he will automatically think of Curtiss-Willis.

We are building and selling new tanks of all kinds in every part of the country.

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TOBACCO, natural leaf, homespun, aged in bulk, best chewing or smoking, 8 lbs., \$4.25; 12 lbs., \$6 postpaid. Special prices on larger quantities. Address TOBACCO GROWERS' UNION, Paris, Tenn., Box 306. Reference any bank here.

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| Motors, | \$25.00 up | Presto Tanks, | \$4.50 up |
| Magnetos, | 4.00 up | New Spotlights, | 2.00 up |
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\$12 Diamond Bumpers.....\$5.50
Jobbers in Bankrupt Auto Supplies.

BRIGHTMAN AUTO EXCHANGE

321 Windsor Ave., Hartford, Conn.

GENERATOR POLARITY.

(R. H. E., Ames, Ia.)

How can I tell the positive side of the generator from the negative?

The practise followed by most manufacturers is to ground the positive wire of the battery and generator to the chassis frame, thus providing for the connection of the negative pole of the generator to the negative pole of the storage battery. The battery is thus charged through the chassis frame, while all return current from the various lighting, starting and ignition units are also returned by wire connection, the positive chassis frame distributing current to each of the units as needed. There is nothing certain about this rule as many other manufacturers ground the negative pole of the battery and generator instead of the positive. As the terminals are marked on the battery, one can tell at a glance what the generator terminals should be.

TIRE INFLATION FOR SUMMER DRIVING.

(W. R. W., St. Paul, Minn.)

Is there any cause other than hot weather for the increase of tire pressures? The pressure increases 15 pounds in my right rear tire and even more in the left rear tire on a hot day. Should tires be inflated to the pressure recommended by the manufacturers, even in summer?

Tire inflation pressures, as recommended by the tire manufacturers, are claimed to be entirely satisfactory for both summer and winter driving and tires as now made are supposed to stand this pressure without bursting. Tires will, however, heat rapidly from friction with the road surface and the friction between the tube and shoe, in proportion to the load carried. Possibly you are carrying an overload on your rear tires which would greatly increase this load proportion. Tire tables also show what load should be carried on tires of different widths and this rule should be followed strictly.

LAPPING PISTON RINGS.

(E. M. J., Fort Worth, Kan.)

What is the method used in fitting piston rings to engine cylinders by the lapping-in process?

Lapping-in is not successfully used for this purpose. It can, however, be used for polishing and, to a slight extent, fitting rigid surfaces which are to run together, but it is not applicable to springy parts like piston rings. These can, however, be hand fitted in their respective cylinders, the operation consisting of bluing the cylinder bore, inserting a ring and withdrawing it, noting the portions of the face which have taken the blue and filing down these high spots until the whole face is blued when the ring is inserted. This is a very

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tedious piece of work, but is said to give good results. It is very little practised, as a suitable ring should fit perfectly in a true cylinder and will wear to an even fit in a short time. This wearing down is, of course, a repetition of the lapping-in process, but hand lapping with emery should be avoided whenever possible, as the emery or other abrasive used has a tendency to imbed itself in the walls of the cylinders, continuing the abrasive action long after its use is no longer required.

NOISY ON ROUGH ROADS.

(W. J. D., Topeka, Kan.)

There is a knock or clatter, apparently in the rear end of my car when it is running over pavements or rough roads, but this is not heard when the car is pulling on a hill or travelling at 25 or 30 miles an hour. It sounds as if it were in the wheels. What is your opinion?

Nothing very definite can be stated as you of course realize that it is very difficult to locate noises from the running board of the car, even when listening for them. The fact that it occurs when you are driving over rough or uneven ground makes us wonder if it may not be a running gear rattle from a loose spring clip, or from the brake linkage. If there was anything wrong with the propeller shaft or the universal joints you would be likely to hear it when driving up-grade as well as on the level. Jack up the rear axle and try the wheels for end play, also drive the wheel with the power of the engine. Often noises that cannot be detected in any other manner may be located when the wheels are driving on the jack. Note if there is excessive lost motion, correcting defects if found. Worn universal joints will often cause chattering when travelling over rough ground. Bear in mind that sound travels through the metal connections and a sound seemingly in the rear may be further front, being heard more plainly when the wheel is running on the ground.

EXHAUST LEAK.

(D. A. W., Philadelphia, Pa.)

My engine makes an uneven noise when running, but the power seems perfectly uniform. There is good compression in all cylinders and no jerky motion, but still it doesn't sound right. How do you account for it?

Probably there is a leak between the exhaust port of one cylinder and its exhaust manifold branch, most likely caused by an imperfect gasket at this point. If you run your engine with fully retarded spark and hold your hand close to the exhaust manifold connections, you may be able to locate the leak by feeling the gas blowing out, or if you kerosene the engine, the leak will probably locate itself by the escape of white smoke. Tightening the manifold connection may stop the leak, but you will probably have to put in a new gasket.

ENGINE USES TOO MUCH OIL.

(O. G. R., Alma, Mich.)

I am getting only about 100 miles per gallon of oil, while I should get getting 400 miles with my car. The compression is uniformly good in all cylinders. Can you suggest the cause for this and a remedy?

Are you sure that you are using a grade of oil suitable for your engine—an oil that maintains a sufficiently heavy body when it is hot? If not, this may partly account for your low mileage. Are you certain that there is no leak directly from the crank case, when the engine is running, an escape between the halves of the case or along the shaft? Are you certain that your oil pressure does not exceed the correct amount? Engines that are well worn in may sometimes be safely run on a lower pressure than those which are new and stiff. Make sure that the oil you use is adapted to your engine and stick to this one grade.

REMOVING BOLTS.

(W. J. B., Lincoln, Neb.)

I am having trouble in removing bolts from an old chassis which has laid out in the rain. I am trying to make this old auto into a light truck, but the bolts are all so rusted as to make the job almost impossible. What suggestion can you make?

The one sure way of removing a bolt that has become rusted in place is to heat an open spanner that will fit the nut and let it rest against the nut for several minutes. This will expand the nut without producing corresponding expansion of the bolt, and the former will turn off easily. Try it and see how it works.

GROUNDING HIGH-TENSION CIRCUIT.

(L. J. B., Jersey City, N. J.)

Why cannot four dry cell batteries, amounting to six volts and 25 amperes each, be made to run a Delco starting motor in a manner similar to a six-volt storage battery?

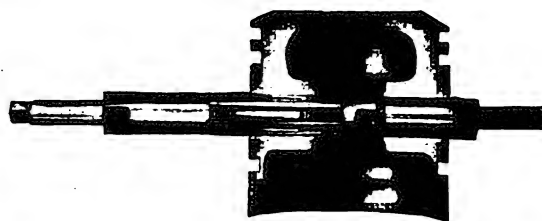
How is it that some ignition systems have the secondary wire of the coil grounded on the negative side direct to the frame, while others are connected to the primary wire and only ground when the contact points are closed? In the former case would not the high-tension current take the shortest route and fail to fire at the plugs?

Four dry cells in series will give approximately six volts' pressure at an amperage of 25 at the start, the amperage dropping off quickly as the battery is used. The reason why the same results cannot be obtained with dry batteries as with storage is that the amperage of the combined dry cells is only 25 and that required to operate a starting motor to turn over an engine runs as high as 75 to 100 amperes at the start, tapering off quickly to a much lower amperage as the engine turns over and begins to turn under its own power. The action on the battery can be likened to kicking over a pail of water and picking it up as quickly as possible. A large amount of the water runs out of the full pail before it can be righted; probably half may be saved. This same action occurs in the storage battery. A heavy amperage is drawn at first and less current is required to turn the engine and motor after the motor starts, till a point is reached where the engine turns under its own power. The starting motor is released and the remaining current available in the battery may be half of the battery capacity, or more or less than this amount, depending upon the length of time taken to start the engine, the tightness of the engine bearings, etc.

So that dry cells of six-volt 25-ampere capacity would not have sufficient current available even to start the engine and motor, to say nothing of turning the engine after being started. If the motor was removed from the car, there is no doubt that the dry cell battery would run the motor for a few minutes.

Your second question relating to grounding one end of the high-tension winding in the coil is easily explained when you stop and think that the high-tension current set up in this fine coil of wire must have a complete circuit to the plugs and return. The coil ground answers two purposes, returning

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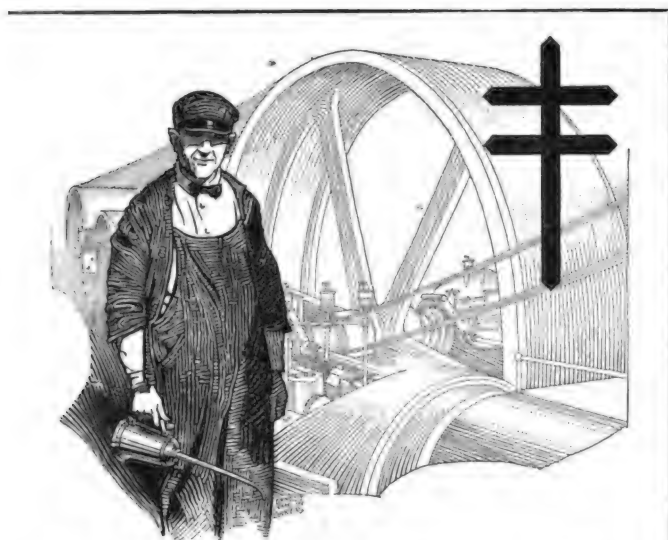
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the high-tension current to the high-tension winding and also completing the condenser circuit, which is placed in the breaker circuit between the points, acting as a buffer against which the current surges as the contact between the points is made and broken. The object of the condenser is to prevent arcing between the contact points of the breaker box, and when the condenser is in perfect condition, arcing and burning of the points is prevented. If the condenser becomes punctured, arcing will occur between the points.

A single ground is used at the coil to conduct the current of the primary through the timer points and to complete the circuit through the plugs and high-tension winding of the coil.

Very often it is found that the primary wire, leading from the switch to the coil, is connected to both the primary and secondary windings at its entrance to the coil. The opposite end of the secondary winding is then carried to the center of the distributor cap and the primary winding is continued through a resistance unit to the breaker contact points, and the circuit to the condenser is tapped at each side of the breaker points. The condenser in this instance may be located on the side of the breaker box, requiring only a short circuit with no ground connections. The opposite end of the breaker box is grounded to provide a circuit for the return of the primary current through the car frame to the storage battery.

The high-tension current from the high-tension winding of the coil flows only in one direction, from negative to positive, and is known as a direct current, so that it cannot, as you suggest, take the shortest path, but must flow into and through the plugs to the ground on the engine, returning from this point back to the high-tension winding of the coil.

CYLINDER FAILS TO FIRE.

(S. V. G., Seattle, Wash.)

One cylinder of my six engine does not fire, although its plug sparks to a screw driver when held near it. The plug is all right because, when placed in another cylinder, it fires it. This cylinder does not slow down the engine when its plug is shorted, but all the other cylinders do. What is the matter with this cylinder?

We suspect from your description that the compression of this cylinder is weak. Either the cylinder is scored, or you have the inlet or exhaust valve holding open.

Note the compression of one of the good cylinders by turning the engine over with the hand starting crank; then remove the plugs from all the cylinders but the one under test and try this cylinder alone, comparing its compression with the good cylinders. If you can turn it without much effort or hear air escaping, you can be sure that either the valves are holding open or there are one or more scores in the walls of the cylinders.

If your engine head can be removed or is fitted with removable plugs over the valves, as in many L-head engines, remove the plugs or head and note if the valves close tight. Grinding the valves of this cylinder may remedy the trouble, but it is good judgment, while the tops of the cylinders are open, to examine the walls for scratches. Even a small scratch will often cause quite a compression leak. After the valves are ground, replace the head or plugs and try the compression again, and listen for air leaks around the plug, head and plug gaskets. Slight leaks at these points will cause a loss of compression and make a difference in engine operation. Squirt a small quantity of oil around the suspected parts and note if air bubbles show when the piston is brought up on compression. This is probably a quicker method of detecting leaks than by listening.

Using the screw driver to make the plug spark is simply a method of cutting out a cylinder to stop its firing and is employed to detect those cylinders that are firing. This accounts for the engine not slowing down when the plug on the weak cylinder is shorted.

Perhaps you may have a leak in the high-tension wire leading from the distributor cover; the wire may pass through a metal tube and, owing to the rubber insulation being old and broken, the current may leak to the metal tube and not reach the plug.

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The plug that *cleans* itself.

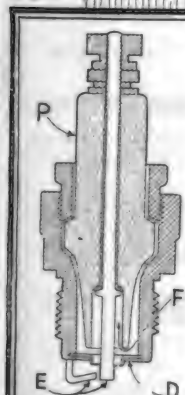
The plug that is *guaranteed* against failure from carbon, fouling by oil, and defects in workmanship and material.

The plug that gives *maximum* power because of complete ignition.

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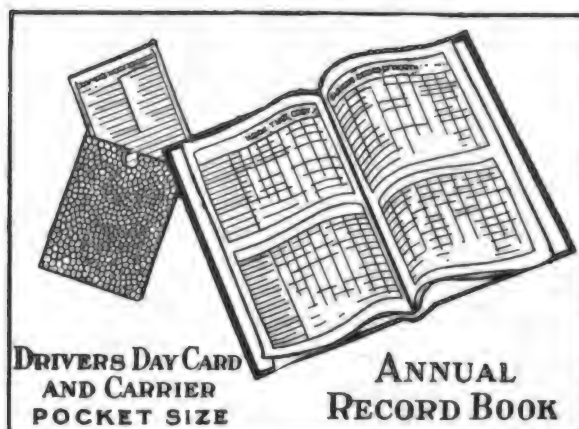
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THE AUTOMOBILE JOURNAL

VOL. LXIX.

PAWTUCKET, R. I., JANUARY, 1922.

NO. 6.

Unsurpassed Displays Promised At New York and Chicago

National Shows May Beat All Records In Magnitude—Car Offerings Unparalleled in Elegance, Refinement and Completeness of Equipment—Accessories Well Represented.

IT MAY be confidently predicted that, in the matter of refinement and elegance and completeness of appointments, the super-creations of latter-day motordom which will be in evidence at the much-heralded and eagerly anticipated show classics to be held this month in New York and Chicago, will be found never to have been eclipsed by any event in the automotive annals of the country. With 92 different manufacturers, represented by a display of cars which will surely reach the 350 mark and may possibly attain 400, these big 1922 National Automobile shows bid fair to exceed in magnitude the colossal pre-war exhibition of 1917 when, according to the records, a total of 342 cars were

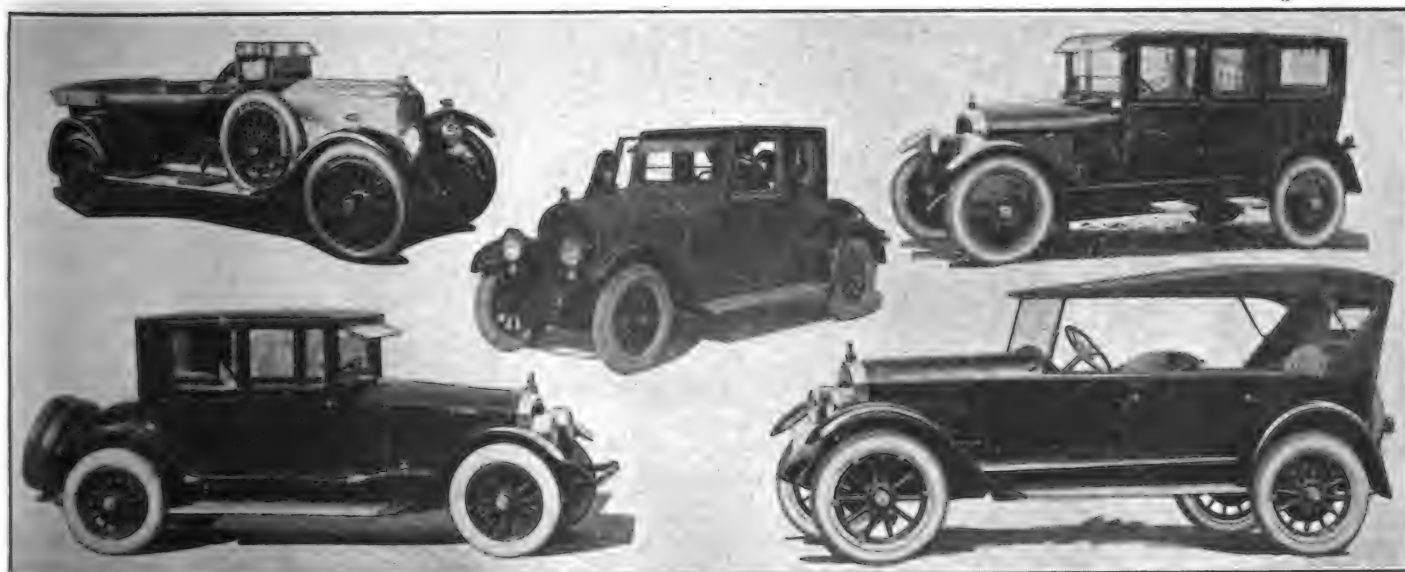
shown, representing 97 of the industry's exhibitors.

As last year, when the radical departure was made towards a complete separation of the passenger and commercial vehicles so far as being featured at the show was concerned, there will be no trucks or tractors on display either at the eastern or western metropolis. There will thus be no division of interest on the part of either exhibitors or their patrons, but a concentration on the utility, beauty of design, equipment and refinements of the passenger car. And this same policy will extend into the accessories department of the exhibitions, which promises, however, to be unprecedented in its magnitude and comprehensiveness, according to advance report.

INTERESTING, indeed, must the contrast be to those who can gauge from personal observation gained by attendance at these two exhibitions, of

1900 and 1922, the marvellous developments in this field. And, in this connection, it is interesting to note that the show management this year has inaugur-

ated a feature which will enable its patrons to make its own comparisons and graphically to visualize the car models of 20 to 25 years ago. An attempt is to be



A Representative Group of the Industry's Finest—Upper Left, Vauxhall Touring; Lower Left, Dorris 6-80, Six-Cylinder, Valve-in-Head; Center, Cole Aero Eight Sport Coupe; Upper Right, Malbohm Sedan, Five-Passenger; Lower, Right, Velle 58.

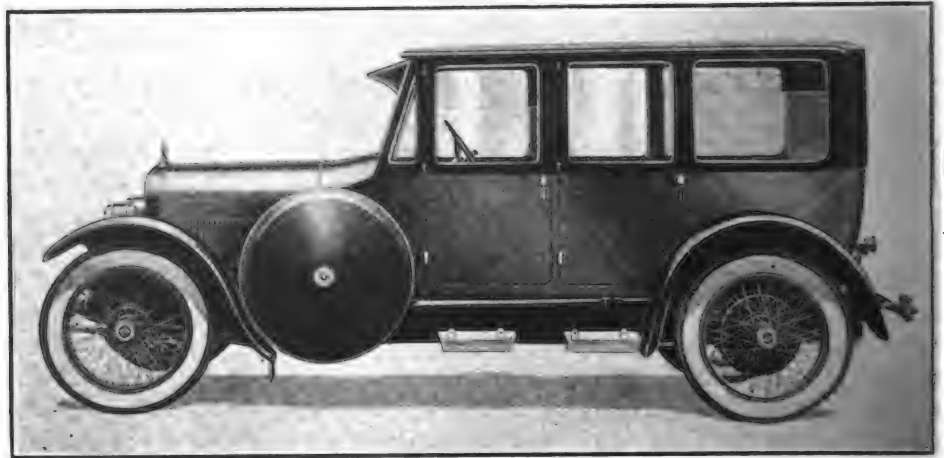


Earl Model 40 Brougham, a Car Worthy of the Name.

made to resurrect the oldest automobile of standard American make still in running condition. The purpose is to give the public a chance to compare the car and equipment furnished in the earlier days with the wonderful devices and appliances that are standard now; to show the value offered today as contrasted with the pioneer days. Most of the cars at the first automobile show in 1900, and for several years afterward, were known as "one lungers," because they were driven by a single-cylinder gasoline engine. Two passengers was usually the limit carried. The equipment was practically nil. There were no closed bodies—not even a windshield protected the occupants; no self-starters, speedometers were unknown, demountable rims were unheard of, in fact no one even carried a spare tire; mirrors, recording devices, bumpers, safety signals, shock absorbers, lighting batteries and clocks had not even been thought of. Even the steering wheel of today was unknown. In fact, one advertisement of a car as late as 1904 said the price included "fenders, lamps, tools and a horn." Generosity, indeed.

The New York show will open at 2 o'clock, Saturday afternoon, Jan. 7, and

for many years, on Lexington avenue, two blocks north of Madison Square Garden, is so well known as to call for no more detailed description. It is a hand-



The H. C. S. Four-Passenger Sedan Attracts Favorable Notice.

some 13-story building, affording 120,000 square feet of show space, well arranged for exhibition purposes. As the opening day approaches interest is reported to be growing apace. The eastern representa-

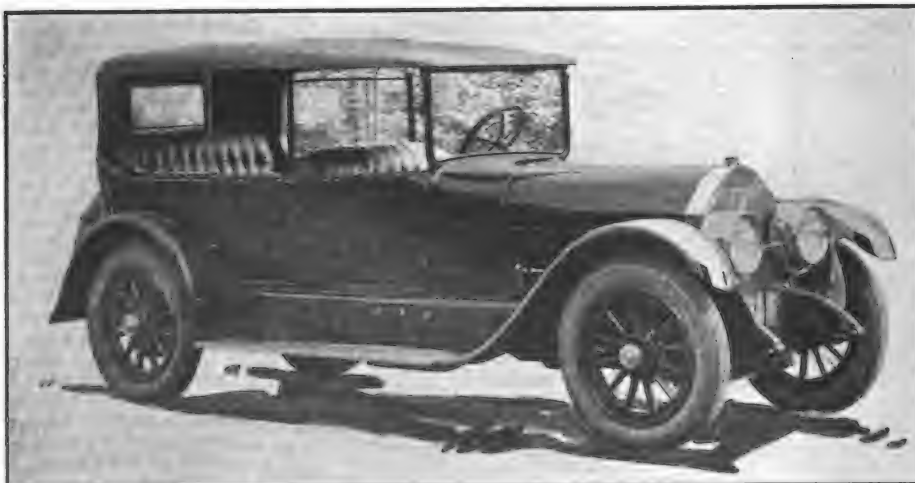
numbers, while practically every large city and hundreds of small towns in the South and West send their representatives.

In fact, reports from all parts of the United States indicate a record influx of this country's automobile men into New York the first week in January. The Los Angeles contingent is getting up a special car to bring a big delegation; Chicago and Detroit men are planning the same kind of a trip, indications that Denver, San Francisco and other points in the far West will be well represented are apparent; many dealers from southern points will motor to New York, unless a blizzard intervenes, and the New England states, especially Massachusetts, will send a big quota of delegates.

The list of cars shown this year at New York, according to late official reports, will include 10 makes of cars that have never been shown there before. These are the Ambassador, Bornville, Durant, Earl, Hadley-Knight, Kelsey, Rick-enbacker, Wills-St. Claire, Itala and Vauxhall, the last two being of foreign manufacture.

The Accessories Display.

More than ever at this season's shows will accessories attract attention, for hundreds of new or improved models of the little appliances and devices repre-



Stevens-Duryea Model E with Tailored California Top.

will continue every day of the week following, Jan. 9 to 14 inclusive, from 10 a. m. to 10:30 p. m. The location of the Grand Central Palace, where the metropolitan show classics have been staged

tives of the larger automobile manufacturers are preparing for one of the biggest weeks in their history. The anticipated record number of exhibitors, both car and accessory, denotes, in the opinion

sending nearly three decades of steady development will be on exhibition. The average visitor to these shows not only studies and examines the cars and body work offered at the expositions, but also finds much of interest in the displays of

sundries, parts and accessories. In fact, far more of the visitors are in the market for accessories than for cars, for most automobile owners eternally desire something new on the car, taking genuine pride in keeping their vehicles as up-to-

date as possible. This is especially true of such articles as spot lights, windshield allersons and modern head lamp designs, refinements and innovations in equipment which prevent the several-seasons-old car from looking too passe.

For 1922 probably the most noticeable feature on many makes of cars will be the changed appearance of the front of the automobile through the adoption of automatic cooling devices. A number of these appeared last season, but the practice has become more general, especially those with thermostatic regulation. Another noticeable feature will be the various forms of vizors, or shades projecting from the top of the windshield frame. Windshield cleaners, which operate automatically in rain or snow-storms, will also be in evidence. These eliminate much of the annoyance of driving under such conditions, as well as tending toward greater safety.

As for the devices designed to protect against theft, there are all sorts of new locks and alleged burglar-proof inventions. The mere reliance on a switch key these days is absolutely no protection against the expert car thief, who knows how to get around this by connecting up the ground wire and then making his get-away with the switch locked. Nor does locking the doors of a closed car afford much security, for too many keys fit the same doors. Various ingenious types of gear-lever, steering wheel and ignition locks will undoubtedly interest show visitors. A new device which prevents the theft of the motorometer or other radiator cap has appeared on the market.

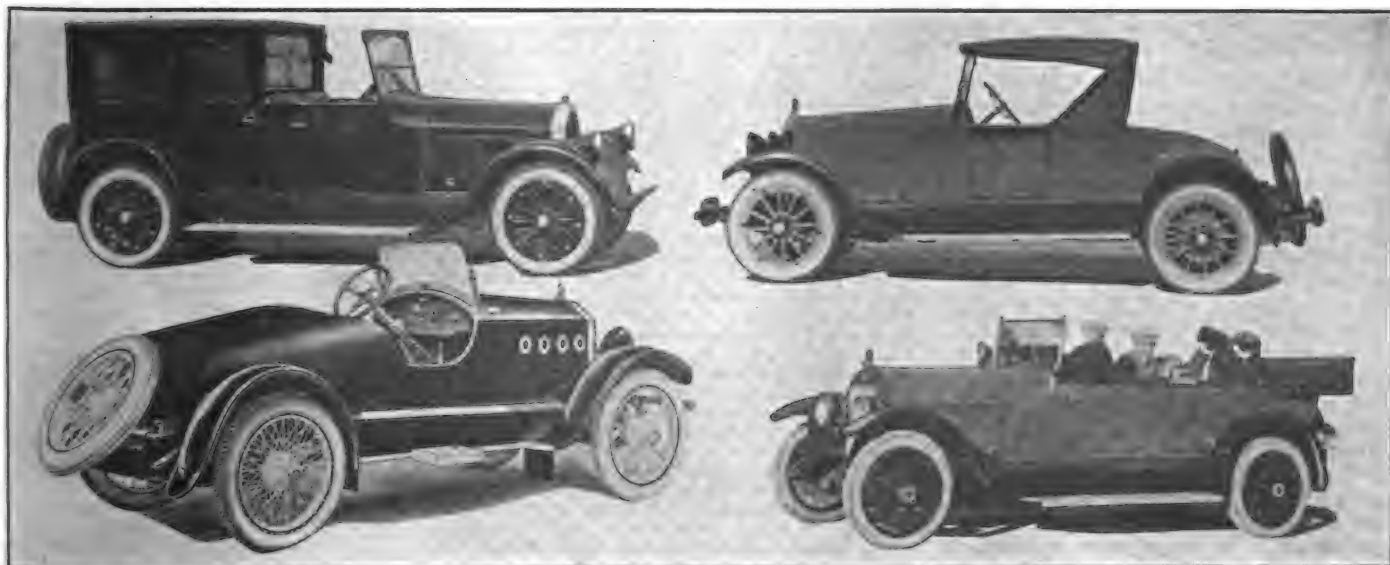
Tail light signals will be featured in many of the cars. During the last few months the practical value of these has been so well demonstrated as to cause many makers to adopt them as standard equipment. The beauty of the tail light signal "Stop" is that it is seen much quicker than the driver's hand extending and is always visible, whereas the driver's hand is often not visible to the motorist directly behind.

Several makes of cars will show a new lubricating system this season by which

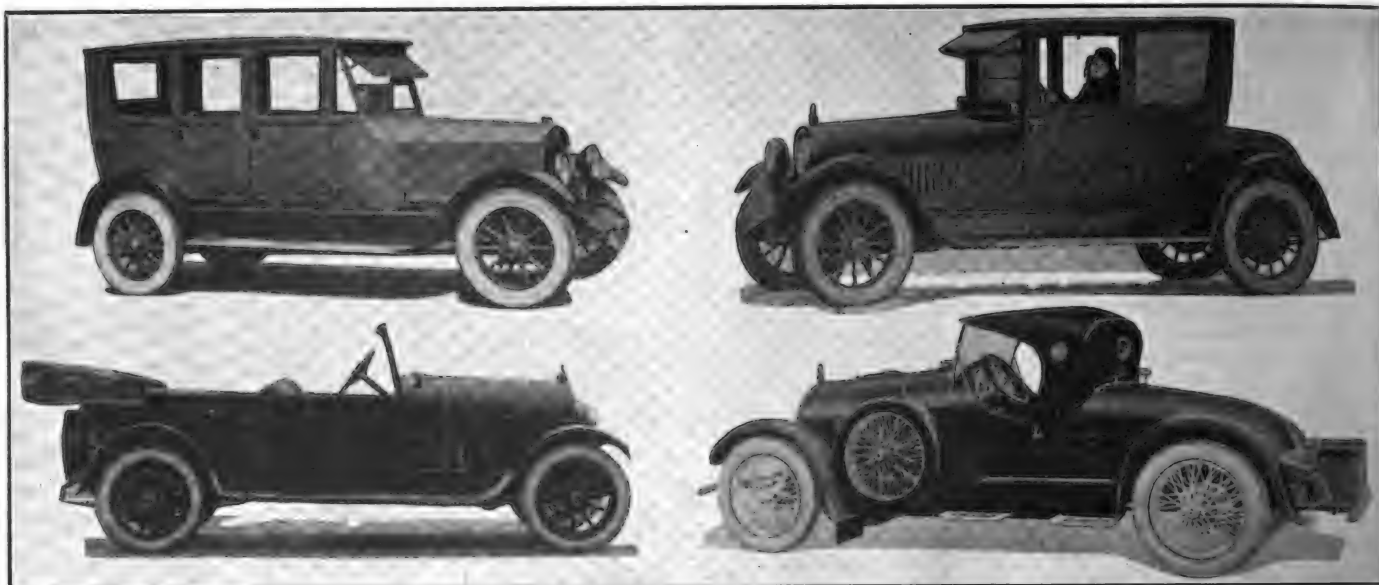
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| Car | Company | Address | N.Y. | Chi. |
|------------------|--------------------------------------|----------------------------------|------|------|
| Anderson | Anderson Motor Co., | Rock Hill, S. C. | • | • |
| Apperson | Apperson Bros. Auto Co., | Kokomo, Ind. | • | • |
| Auburn | Auburn Auto Co., | Auburn, Ind. | • | • |
| Roamer | Barley Motor Car Co., | Kalamazoo, Mich. | • | • |
| Rotary Six | Bourbonville Rotary Valve Motor Co., | 130 Harrison St., Hoboken, N. J. | • | • |
| Buick | Buick Motor Co., | Flint, Mich. | • | • |
| Cadillac | Cadillac Motor Car Co., | Detroit, Mich. | • | • |
| Hatfield | Cortland Cart & Cge. Co., | Sidney, N. Y. | • | • |
| Case | J. I. Case T. M. Co., | Racine, Wis. | • | • |
| Chalmers | Chalmers Motor Car Co., | Detroit, Mich. | • | • |
| Chandler | Chandler Motor Car Co., | Cleveland, O. | • | • |
| Chevrolet | Chevrolet Motor Co., | Detroit, Mich. | • | • |
| Cleveland | Cleveland Auto Co., | Cleveland, O. | • | • |
| Cole | Cole Motor Car Co., | Indianapolis, Ind. | • | • |
| Columbia | Columbia Motors Co., | Detroit, Mich. | • | • |
| Commonwealth | Commonwealth Motors Co., | Chicago, Ill. | • | • |
| Crow-Elkhart | Crow-Elkhart Motor Corp., | Elkhart, Ind. | • | • |
| Davis | Geo. W. Davis Motor Car Co., | Richmond, Ind. | • | • |
| Detroit-Electric | Detroit Elec. Car Co., | Detroit, Mich. | • | • |
| Dodge Brothers | Dodge Bros., | Detroit, Mich. | • | • |
| Dorris | Dorris Motor Car Co., | St. Louis, Mo. | • | • |
| Dort | Dort Motor Car Co., | Flint, Mich. | • | • |
| duPont | duPont Motors, Ind., | Moore, Pa. | • | • |
| Durant | Durant Motor Co., of N. Y., Inc., | L. I. City, N. Y. | • | • |
| Earl | Earl Motors, Inc., | Jackson, Mich. | • | • |
| Elgin | Elgin Motor Car Corp., | Argo, Ill. | • | • |
| Elcar | Elkhart Carriage & Motor Car Co., | Elkhart, Ind. | • | • |
| Essex | Essex Motors, Detroit, Mich. | | • | • |
| Franklin | H. H. Franklin Mfg. Co., | Syracuse, N. Y. | • | • |
| Gardner | Gardner Motor Co., Inc., | St. Louis, Mo. | • | • |
| Grant | Grant Motor Car Corp., | Cleveland, O. | • | • |
| H. C. S. | H. C. S. Motor Car Co., | Indianapolis, Ind. | • | • |
| Handley-Knight | Handley-Knight Co., | Kalamazoo, Mich. | • | • |
| Hanson | Hanson Motor Co., | Atlanta, Ga. | • | • |
| Haynes | Haynes Auto Co., | Kokomo, Ind. | • | • |
| Holmes | Holmes Auto Co., | Canton, O. | • | • |
| Hudson | Hudson Motor Car Co., | Detroit, Mich. | • | • |
| Hupmobile | Hupp Motor Car Corp., | Detroit, Mich. | • | • |
| Itala | Itala Fabbria Automobili, | Torino, Italy. | • | • |
| Jackson | Jackson Motors Corp., | Jackson, Mich. | • | • |
| Jordan | Jordan Motor Car Co., | Cleveland, O. | • | • |
| Kelsey | Kelsey Motor Co., | Newark, N. J. | • | • |
| Dixie Flyer | Kentucky Wagon Mfg. Co., | Louisville, Ky. | • | • |
| King | King Motor Car Co., | Detroit, Mich. | • | • |
| Kissel Kar | Kissel Motor Car Co., | Hartford, Wis. | • | • |
| Kline Kar | Kline Car Corp., | Richmond, Ind. | • | • |
| Lafayette | Lafayette Motors Co., | Indianapolis, Ind. | • | • |
| Leach-Biltwell | Leach-Biltwell Motor Car Co., | Los Angeles, Cal. | • | • |
| Lexington | Lexington Motor Co., | Connersville, Ind. | • | • |
| Liberty | Liberty Motor Car Co., | Detroit, Mich. | • | • |
| Lincoln | Lincoln Motor Co., | Detroit, Mich. | • | • |
| Locomobile | Locomobile Co., | Bridgeport, Conn. | • | • |



Exhibitions Show an Equitably Priced Car for Every Purse—Here Are Depicted: Upper Left, Pierce-Arrow French Limousine; Lower Left, Dixie Flyer, Sport Roadster; Upper Right, Auburn Beauty Six, Two-Passenger; Lower Right, Stutz 6-7 Touring.



Another Group of Fine Offerings for Next Season—Upper Left, Stanley Seven-Passenger Sedan; Lower Left, Newest Lexington Product, Ansted Engine; Upper Right, Hudson Coupe; Lower Right, Kiesel Sport Model, with Luggage Rack and Bumpers.

all parts of the chassis requiring lubrication will receive it under pressure through flexible piping, the system being operated by buttons on the dash board. As for body work, all sorts and varieties embracing new features will be offered.

A complete catalogue of the many devices to be seen at the show would fill columns. There will be the latest word in carburetors, batteries, lamps, mirrors, shields, lubricating systems, lubricants, tires, recording devices, automobile hardware, engines, pumps, chemicals, bumpers, safety signals, horns, motor appliances and parts, shock absorbers, cushions, curtains, clocks, wheels and removable tops and bodies. In fact the accessory section of the national shows will be a feature that will be well worth any motorist's attention. The majority of these exhibitors are members of the Motor and Accessory Manufacturers' association.

S. A. Miles, general manager of the show, is endeavoring to find room for additional exhibitors, as he has nearly 100 applications that came in too late to secure booths.

Interest in Show Manifested Abroad.

It is evident that wonderful interest is being taken in foreign countries this year in the big American shows. Every year Europe, South America, Canada and even the Far East have sent representatives here to study the progress of American manufacturers, but this year the delegations are certain to be unusually large. Both London and Paris have had their annual motor car shows and as the date for the big events in the United States draw near, it appears as if the 1922 exposition would break all records for foreign visitors.

Among the prominent automobile men who are planning to attend are Peter Brown of Brown Brothers, Ltd., and Bernard R. Bangs, manager of the motor department of the same firm, of London. Brown Brothers is a large accessory concern in Europe and both members will remain in this country for the Chicago

| Car | Company | Address | N.Y. Chl. |
|------------------|--|-----------------------|-----------|
| McFarlan | McFarlan Motor Corp., | Connersville, Ind. | • |
| Malbohm | Malbohm Motors Co., | Sandusky, O. | • |
| Maxwell | Maxwell Motor Corp., | Detroit, Mich. | • |
| Mercer | Mercer Motors Co., | Trenton, N. J. | • |
| Milburn Electric | Milburn Wagon Co., | Toledo, O. | • |
| Mitchell | Mitchell Motors Co., Inc., | Racine, Wis. | • |
| Moon | Moon Motor Car Co., | St. Louis, Mo. | • |
| Nash | Nash Motors Co., | Kenosha, Wis. | • |
| National | National Motor Car & V. Corp., | Indianapolis, Ind. | • |
| Noma | Noma Motor Corp., | New York City | • |
| Marmon | Nordyke & Marmon Co., | Indianapolis, Ind. | • |
| Oakland | Oakland Motor Car Co., | Pontiac, Mich. | • |
| Oldsmobile | Olds Motor Works, | Lansing, Mich. | • |
| Packard | Packard Motor Car Co., | Detroit, Mich. | • |
| Paige | Paige-Detroit Motor Car Co., | Detroit, Mich. | • |
| Paterson | W. A. Paterson Co., | Flint, Mich. | • |
| Peerless | Peerless Motor Car Co., | Cleveland, O. | • |
| Pierce-Arrow | Pierce-Arrow Motor Car Co., | Buffalo, N. Y. | • |
| Pilot | Pilot Motor Car Co., | Richmond, Ind. | • |
| Premier | Premier Motor Corp., | Indianapolis, Ind. | • |
| R. & V. Knight | R. & V. Motor Co., | East Moline, Ill. | • |
| Rauch-Lang | Rauch & Lang, Inc., | Chicopee Falls, Mass. | • |
| Reo | Reo Motor Car Co., | Lansing, Mich. | • |
| Rickenbacker | Rickenbacker Motor Co., | Detroit, Mich. | • |
| Saxon | Saxon Motor Car Corp., | Detroit, Mich. | • |
| Standard | Standard Steel Car Co., | Pittsburgh, Pa. | • |
| Stanley | Stanley Motor Carriage Co., | Newton, Mass. | • |
| Stearns | F. B. Stearns Co., | Cleveland, O. | • |
| Stephens | Stephens Motor Works, | Freeport, Ill. | • |
| Stevens-Duryea | Stevens-Duryea, Inc., | Chicopee Falls, Mass. | • |
| Studebaker | Studebaker Corp., | South Bend, Ind. | • |
| Stutz | Stutz Motor Car Co., | Indianapolis, Ind. | • |
| Templar | Templar Motors Co., | Cleveland, O. | • |
| Vauxhall | Vauxhall Motors, Ltd., | Toronto, Canada | • |
| Velle | Velle Motors Corp., | Moline, Ill. | • |
| Westcott | Westcott Motor Car Co., | Springfield, O. | • |
| Willis St. Clair | C. H. Willis & Co., | Marysville, Mich. | • |
| Overland | Willis-Knight, Willlys-Overland, Inc., | Toledo, O. | • |
| Ambassador | Yellow Cab Mfg. Co., | Chicago, Ill. | • |

ACCESSORIES

| | | |
|------------------------------------|---------------------|---|
| Able Mfg. Co., Inc., | San Francisco, Cal. | • |
| Acme Die Casting Corp., | Brooklyn, N. Y. | • |
| Acme Motor Shield Corp., | New York | • |
| Akkurate Loose Leaf Co., Inc., | New York | • |
| Alexander Mirrorscope Co., | New York | • |
| Algonquin Electric Mfg. Corp., | Poughkeepsie, N. Y. | • |
| American Auto Lamp Co., Inc., | New York | • |
| American Chain Co., Inc., | Bridgeport, Conn. | • |
| American Non-Ferrous Metals Corp., | Elizabeth, N. J. | • |
| American Pump & Tank Co., | New York | • |
| American Steel Foundries, | Chicago, Ill. | • |
| American Taximeter Co., | New York | • |
| American Wood Rim Co., | Onaway, Mich. | • |
| Anchor Top & Body Co., | Cincinnati, O. | • |
| Apex Elec. Mfg. Co., | Chicago, Ill. | • |
| Apollo Magneto Corp., | Kingston, N. Y. | • |
| Arkay Sales Co., | New York | • |
| Arrow-Grip Mfg. Co., Inc., | Glen Falls, N. Y. | • |
| Asch & Co., Inc., | New York | • |
| Atlas Crucible Steel Co., | Dunkirk, N. Y. | • |
| Auto Bed Camp Mfg. Co., | New York | • |
| Auto Pedal Pad Co., Inc., | New York | • |
| Automobile Journal Pub. Co., | Pawtucket, R. I. | • |

(Continued on Page 34.)

Directory of Automotive Concerns, Representatives and Locations at New York—Chicago Shows

Acme Die Casting Corp.—Pres., Geo. W. Bungay; Vice Pres., A. G. Hamilton; Sec., H. I. Mulligan; Treas., A. G. Hamilton; Engineer, Geo. W. Bungay; Sales Mgr., A. G. Hamilton; Production Mgr., H. I. Mulligan; Representatives, H. H. Almond, C. J. Sheehan, N. Y. Show Space, D-132.

Acme Motor Shield Corp.—Pres., J. B. McMullen; Treas., R. T. Naylor; Sales Mgr., L. H. Jockmus, N. Y. Show Space, D-165; Chicago, 30 Basement.

Akkurate Loose-Leaf Co., Inc.—Pres., A. J. Mirski, N. Y. Show Space, D-52.

Alexander Microscope Co.—Pres., A. S. Alexander; Vice Pres., K. A. Veit; Sec., J. C. Holton; Treas., K. A. Veit; Engineer, H. L. Baier; Sales Mgr., M. Brown; Production Mgr., K. A. Veit; Advertising Mgr., A. S. Alexander, N. Y. Show Space, D-16; Chicago, 67.

American Auto Lamp Co., Inc.—Pres., William Berk; Sec. and Treas., Benjamin Putterman, N. Y. Show Spaces, D-83 and D-114.

American Pump & Tool Co.—Pres., E. N. Blakeslee, N. Y. Show Space, D-110.

American Wood Rim Co.—Pres., E. J. Lobdell; Treas., E. J. Lobdell; Sales Mgr., R. O. Mead; Production Mgr., E. J. Lobdell, Jr.; Representatives, E. J. Lobdell, R. O. Mead, B. E. Beers, P. M. Barrows, N. Y. Show Space, C-79; Chicago, 16, Gallery.

Anchor Top & Body Co.—Sec. and Treas., O. A. Klausmeyer; Sales Mgr., R. E. Wallace; Representative, R. E. Wallace, N. Y. Show Spaces, D-206-211; Chicago, 191-196 inclusive.

Anderson Motor Co.—Pres., J. G. Anderson; Vice Pres., J. W. Anderson; Sec., E. B. Gunter, Jr.; District Mgrs., C. T. O'Fallon, Sanford Smith, H. M. Dunham; Engineer, C. A. Debs; Sales Mgr., W. A. Anderson; Asst. Sales Mgr., W. J. Weber; Advertising Mgr., W. C. Little, N. Y. Show Space, C-20; Chicago, C-1.

Apperson Bros. Automobile Co.—Pres., Edgar L. Apperson; Vice Pres., T. E. Jarrard; Sec. and Treas., A. G. Dawson; Engineer, B. J. Hubbard; Sales Mgr., T. E. Jarrard; Production Mgr., H. H. Crites, N. Y. Show Space, A-28; Chicago, Q-1.

Apollo Magneto Corp.—Gen. Mgr., J. K. Lencke; Engineer, H. Schmid; Representatives, J. K. Lencke, H. Schmid, J. Graham, H. J. Argue, R. W. Edge, G. F. Wertzler, New York Show Space, D-203; Chicago, 197 and 198.

Arkay Sales Co.—Gen. Mgr., Harry Lubben; Sales Mgr., William Kaudel; District Mgr., Jack H. Guttman, N. Y. Show Space, D-147.

Arrow Grip Mfg. Co., Inc.—Sec. and Gen. Mgr., Thomas Rogers; Representatives, G. B. Wells, Harry Van Horn, J. B. Rice, E. W. Lenz, E. F. Merritt, J. J. Gannon, N. Y. Show Space, D-53; Chicago, 4.

Asch & Co.—Pres., B. M. Asch; Sec., E. R. Lee; Engineer, J. M. Lydecker; Representatives, W. Weber, H. W. Doble, J. Greenman, A. Goll, M. F. Chase, C. Hoper, N. Y. Show Spaces, D-47 and 48, D-81 and 82; Chicago, 154-158, inclusive, Coliseum Annex.

Auburn Automobile Co.—Vice Pres., A. P. Kemp; Engineer, A. M. Graffis; Sales Mgr., J. I. Farley; Asst. Sales Mgrs., R. G. Ewell, Chas. M. Strieby; Representatives, I. B. Meers, M. E. Garrett, Donn R. Shelton, T. C. Callaway, L. H. Smith, R. T. Delafeld, Clarence Houston, N. Y. Show Space, A-24; Chicago, E-1.

Auto Bed Camp Mfg. Co.—Representatives, J. H. Wittmann, H. B. Jones, A. H. Van Doran, Walter Wagner, N. Y. Show Space, D-169-170-171; Chicago, 38 and 39 Balcony, First Regiment Armory.

Automotive Gear Works—Pres., E. P. Horton; Vice Pres., C. E. Hamilton, N. Y. Show Space, C-108; Chicago, 96.

Automotive Parts Mfg. Co.—Engineer, S. Siegel; Sales Mgr., N. C. Greene; Representatives, S. Siegel, N. C. Greene, J. Mendel, E. J. Lambert, A. P. Wagner, N. Y. Show Space, D-41.

Auto Pedal Pad Co., Inc.—Pres., Daniel Sinclair; Vice Pres., Charles Willmore; Sec., Mrs. Jessie Sinclair; Treas., James Lovegrove; Sales Mgr., Daniel Sinclair; Adv. Mgr., Daniel Sinclair, N. Y. Show Space, D-26.

Badger Mfg. Corp.—Pres., Chas. H. Hathaway; Sales Mgr., H. D. Wakefield; Chicago Show, Spaces 27 and 28.

Barnes Foundry Co., Inc.—Pres., S. E. Barnes; Vice Pres., Arthur A. White; Sec. and Treas., Kenneth Skinner; Engineer, E. Werner; Representatives, K. Skinner, A. White, N. Y. Show Space, D-140.

Wallace Barnes Co.—Sec., H. C. Barnes; Treas., F. F. Barnes; Engineer, J. E. Andrew; Sales Mgr., Brown Joyce, N. Y. Show Space, C-99.

Bassick Mfg. Co.—Pres., E. W. Bassick; Vice Pres., D. F. Fesler, C. I. Overton; Sales Mgr., P. D. Wilson, N. Y. Show Space, D-61 and 62; Chicago, 90 and 91.

Becker Bros., Inc.—Pres., O. E. Becker; Vice Pres., C. J. Becker; Sec., W. F. Becker; Representative, A. E. Schmalz, N. Y. Show Space, D-64; Chicago, 69.

Bencke & Kropf Mfg. Co.—Pres., Henry Bencke; Sales Mgr., C. J. Slater, N. Y. Show Space, C-81; Chicago, 18 and 25.

Benzer Corp.—Pres., H. Benzer; Engineer, I. Fabricand; Sales and Adv. Mgr., Jay H. Berkman, N. Y. Show Space, D-89.

The Borg & Beck Co.—Vice Pres., Geo. W. Borg; Engineer, D. E. Gamble; Sales Mgr., William Mack; Production Mgr., J. J. Hartley; Representatives, J. W. Hobbs, C. M. Ahlene.

B. G. Corp.—Pres., August Goldsmith; Vice Pres., Richard Goldsmith; Sec., Thomas S. Mack; Treas., Arthur J. Goldsmith; Engineers, Roy T. Hurley, M. E. Cheney, Geo. R. Blodgett, N. Y. Show Space, D-166; Chicago, 73.

C. G. Bird Mfg. Co.—Sales, Production and Adv. Mgr., C. G. Bird, Chicago Show Space, 85, Coliseum Basement.

Blackledge Mfg. Co.—Mgr., J. W. Blackledge; Representative, John W. Blackledge, N. Y. Show Space, C-50; Chicago, 58, Coliseum Balcony.

Bournonville Rotary Valve Motor Co.—Pres., Eug. Bournonville; Sec. and Treas., H. I. Tuthill; Engineer, C. F. Smith, N. Y. Show Space, D-10-12.

Bowen Products Corp.—Engineer, C. A. Bacon; Sales Mgr., L. A. Austin, Chicago Show Space, 18, Basement.

Bridgeport Coach Lace Co.—Sec., H. D. Naramore; Production Mgr., J. J. Edington; Adv. Mgr., E. J. Morrell; Representatives, W. A. Weeks, W. H. McDonald, R. G. Lane, H. T. Von Frankenberg, F. H. Allis, T. N. Wakeman, R. H. Cover, N. Y. Show Space, C-42; Chicago, 4 and 5.

Edward G. Budd Mfg. Co.—Pres., Edward G. Budd; Vice Pres., Hugh L. Adams; Sec. and Treas., William B. Read; Engineer, Joseph Ledwinka; Sales Mgr., Hugh L. Adams; Production Mgr., Otto C. Schoenwerk, N. Y. Show Spaces, D-161 and 162.

Burpee-Johnson Co.—Pres., Walter C. Johnson; Sec. and Treas., C. M. Burpee; Sales Mgr., R. R. Elliott; Field Mgr., J. O. Humbert, N. Y. Show Space, D-153; Chicago, 57 and 58.

Chalmers Motor Car Co.—Vice Pres., A. E. Barker; Director of Sales, E. W. Clark; Adv. Mgr., W. J. Mattimore, N. Y. Show Space, A-2; Chicago, A-2.

Champion Ignition Co.—Sales Mgr., W. S. Isherwood; Representatives, C. A. Hoover, A. G. Neubauer, N. Y. Show Space, 355 and 356; Chicago, 209 and 210.

Champion Mfg. Co.—Pres., Chas. P. Dunbaugh; Sec., Geo. J. Dunbaugh, Jr.; Representatives, Chas. T. Mahon, Bradley M. Provis, Walter F. Reed, Chicago Show Space, 84.

Champion Pneumatic Machinery Co.—Treas., H. H. Kouka; Representative, H. H. Kouka, N. Y. Show Space, D-200; Chicago, 95.

Chandler Motor Car Co.—Pres., F. C. Chandler; Vice Pres., Geo. M. Graham;

Treas., Samuel Regar; Engineer, Hiram M. Walker; Sales Mgr., F. E. Connor; Adv. Mgr., John M. Howard, N. Y. Show Space, A-27; Chicago, B-4.

Chicago Tool & Kit Mfg. Co.—Pres., J. F. Greenebaum; Chicago Show Space, 92, Basement.

Clark Equipment Co.—Vice Pres., R. J. Burrows and E. B. Ross; Adv. Mgr., E. W. Clark; Sales Engineer, J. P. Ware; Mgr. Axle Dept., E. C. Mogford; Salesman, C. A. Kiefer, N. Y. Show Space, D-30 to D-32, inclusive; Chicago, 141-147, inclusive.

Cleveland Automobile Co.—Pres., J. V. Whitbeck; Vice Pres. and Sales Mgr., Sid Black; Treas., J. I. Krall; Engineer, E. Wooler; Asst. Sales Mgr., W. B. Westcott; Service Mgr., J. T. Nicholson; Representatives, J. M. Wetmore, A. C. Clemensen, E. O. Ingram, J. J. Martin, Chas. Warfield, Harrison Goldsmith, LeRoy V. Jones, N. Y. Show Space, A-32; Chicago, D-6.

Cole Motor Car Co.—Pres., J. J. Cole; Vice Pres., S. J. Kuqua; Sec. and Treas., J. F. Morrison; Auditor, J. A. Murphy; Engineer, M. B. Covert; Asst. Gen. Mgr., J. H. McDuffee; Adv. Dept., C. A. Snyder; Adv. Mgr., Homer McKee; Representatives, J. H. McDuffee, J. F. Morrison, Walter Biel-ing, Russell L. Engs, A. H. Bachele, E. C. Frady, N. Y. Show Space, A-1; Chicago, G-2.

Collins Puncture-Proof Tube Co.—Pres., William H. Roberts; Asst. Sec., Stanley Roberts; Sales Mgr., T. A. Collins; Production Mgr., Geo. W. Collins; Representatives, T. A. Collins, Geo. W. Collins, Stanley Roberts.

Columbia Axle Co.—Vice Pres., E. H. Parkhurst; Treas., B. F. Hopkins; Engineer, R. E. Fries; Production Mgr., R. J. Goldie; Sales Engineer, B. D. DeWeese, Headquarters at New York—Commodore Hotel; Chicago, La Salle Hotel.

Commonwealth Motors Co.—Pres., M. M. Markin; Vice Pres., A. R. Carlson; Sec. and Sales Mgr., W. L. Kraeberger; Treas., E. J. Bouchard; Engineer and Vice Pres., L. J. Goodspeed; Production Mgr., H. Humphries, N. Y. Show Space, C-8; Chicago, C-4.

Continental Motors Corp.—Pres., R. W. Judson; Vice Pres. and Treas., G. W. Yeoman; Vice Pres. and Sec., W. R. Angell; Vice Pres. of Engineering, W. A. Frederick; Sales Mgr., C. D. McKim; Vice Pres. of Production, J. F. Bourquin; Representatives, C. D. McKim, O. R. Baird, J. F. Pope, N. Y. Show Space, C-60-61-62; Chicago, 50 and 51.

C. Cowles & Co.—Pres., C. Cowles; Sec., M. S. Bottume; Treas., C. M. Costello; Engineers, L. W. Gates, Frank Hart; Sales Mgr., M. S. Bottume; Production Mgr., A. J. Schreck; Adv. Mgr., L. C. Cowles; Representatives, W. A. Carmichael, Jas. Brophy, T. T. Welles, M. S. Bottume, W. A. Carmichael, N. Y. Show Space, C-30; Chicago, 80.

Cox Brass Mfg. Co.—Pres., Wm. G. Cox; Treas., T. M. Cox, N. Y. Show Spaces, D-157 and 158; Chicago, 178, Coliseum Annex.

Crow-Elkhart Motor Corp.—Pres., M. E. Hoshaw; Vice Pres., D. C. Thomas; Sec. and Treas., Henry Lichtig; Engineer, A. C. Schell; Asst. Sales Mgr., R. R. O'Hearn; Production Mgr., M. E. Hoshaw; Advertising Mgr., R. R. O'Hearn, N. Y. Show Space, B-7; Chicago, A-7.

Damon Mfg. Co.—Pres., Dr. W. H. Damon; Vice Pres., Charles H. Brownson; Sales Mgr., Charles Rathner; Representatives, Dr. W. H. Damon, Charles H. Brownson, W. W. Campbell, Charles Rathner, Chicago Show Space, 66 Coliseum Basement.

Geo. W. Davis Motor Car Co.—Pres., Geo. W. Davis; Vice Pres., Scott A. Lewis; Sec., Walter C. Davis; Treas., W. H. Cummins; Engineer, Earl F. Winchester; Sales Mgr., Walter C. Davis; Production Mgr., Scott A. Lewis; Adv. Mgr., Walter C. Davis, N. Y. Show Space, B-6; Chicago, A-3, First Regiment Armory.

A. J. Detlaff Co.—Pres., A. J. Detlaff; Sales Mgr., F. Rlockwood. Chicago Show Space, 9, Coliseum Gallery.

Detroit Electric Car Co.—Pres., W. C. Anderson; Vice Pres., Geo. M. Bacon; Treas., F. E. Price; Sales Mgr., A. C. Downing. N. Y. Show Space, C-6; Chicago, E-6.

Detroit Pressed Steel Co.—Vice Pres., C. H. L. Flintermann; Engineer, A. L. Putnam; Sales Mgr., G. H. Hunt; Production Mgr., J. W. Peterson; Adv. Mgr., W. H. Huff. N. Y. Show Space, C-89 and 90; Chicago, 56-73.

Dextra Sales Co.—Pres., J. C. Sanders; Sec. and Treas., C. E. Fyan; Engineer, C. E. Fyan; Sales Dept., A. E. Burridge, W. G. Scott; Adv. Mgr., J. C. Sanders. Chicago Show Space, 5, Balcony, First Regiment Armory.

Disbrow Mfg. Co.—Treas., John Hartkopf; Sales Mgr., Louis Disbrow; Adv. Mgr., F. L. Cliverton; Representatives, Louis Disbrow, F. L. Cliverton, John Hartkopf. N. Y. Show Space, D-35; Chicago, 313, Coliseum Annex.

Dodge Brothers—Pres., F. J. Haynes; Sec., H. V. Popeney; Engineer, Russell Huff; Sales Mgr., C. W. Matheson; Production Mgr., A. Z. Mitchell; Adv. Mgr., G. H. Phelps. N. Y. Show Space, A-2; Chicago, D-1.

Dorris Motor Car Co.—Pres. & Chief Engineer, Geo. P. Dorris; Vice Pres., Webster Colburn; Sec. and Treas., J. F. Culver; Designing Engineer, V. C. Kloepper; Sales Mgr., J. T. Rumble; Production Mgr., A. B. Horton. N. Y. Show Space, C-4; Chicago, B-8, First Regiment Armory.

Double Safety Signal Co.—Pres., I. V. Edgerton; Vice Pres., J. H. Krause; Sec., E. Frick; Treas., E. Schewil; Sales Mgr., I. V. Edgerton. Chicago Show Space, 7.

Double Seal Ring Co.—Engineer, O. P. Sells. N. Y. Show Space, D-227.

E. A. Laboratories, Inc.—Pres., M. Aufero; Vice Pres., Wm. Von Elm; Sec., W. G. Howard; Engineer, E. Aufero; Sales Mgr., Wm. Von Elm; Representatives, Wm. Von Elm, C. L. Falkinburg, W. G. Howard, R. J. St. John, G. S. Montfort, E. Aufero, M. Aufero, T. F. Sanford. N. Y. Show Space, C-63; Chicago, 70.

Earl Motors—Pres., C. A. Earl; Vice Pres., H. F. Wardwell; Sec., L. E. Latta; Treas., John Fletcher; Engineer, Victor Jantsch; Sales Mgr., Kelly R. Jacoby; Production Mgr., W. B. Jameson; Adv. Mgr., David Minard Shaw; Asst. Gen. Sales Mgr., R. N. Cowham; Representatives, A. T. McKay, R. N. Cowham, J. C. Baggott, Fred Rosche, Hugh Campbell, Mr. Brandenburg, G. C. Jefferson, Ralph Chapman, C. L. Thurston, K. Van Court.

Eclipse Machine Co.—Pres., E. J. Dunn; Gen. Mgr., J. C. Ferguson; Chief Engineer, W. L. McGrath; Sales Mgr., Henry Bush; Engineers, M. P. Ferguson, M. P. Whitney. N. Y. Show Space, C-44; Chicago, 71.

Elgin Motor Car Corp.—Pres., C. S. Riegan; Sec. and Treas., W. G. Knoedler; Engineer, C. S. Pope; Asst. Sales Mgr., L. F. Johnston; Production Mgr., J. G. Anderson; Adv. Mgr., A. L. Chambers. N. Y. Show Space, B-30; Chicago, J-1 Coliseum.

Elkhart Carriage & Motor Car Co.—Vice Pres., W. H. Patterson; Vice Pres., and Sales Mgr., U. G. Manning; Sec., G. B. Pratt; Treas., J. A. Bell. N. Y. Show Space, B-14; Chicago, Q-4.

English & Mersick Co.—Vice Pres. and Sales Mgr., Will H. Ritter; Engineer, E. K. Williams; Production Mgr., G. E. Wheeler. N. Y. Show Spaces, D-98 and 99; Chicago, Congress Hotel.

Fan Flame Spark Plug Co.—Pres., John H. Gill; Treas., F. W. Dyer; Sales Mgr., F. S. Davis. N. Y. Show Space, D-111.

J. H. Faw Co.—Proprietor, J. H. Faw; Representatives, J. H. Faw, W. A. Kilmartin, E. E. MacElroy. N. Y. Show Space, D-46.

Fire-Gun Mfg. Co.—Pres., F. M. DeVoe; Vice Pres., W. G. Gallowhur; Sec., J. S. Howell; Treas., W. G. Gallowhur; Purchasing Agent, E. F. Delfoe; Engineer, H. E. Tunnell; Sales Mgr., W. G. Gallowhur; Production Mgr., H. E. Tunnell; Manager in Charge of Exhibition, E. F. Delfoe. N. Y. Show Space, D-50.

Fischer Sweeney Bronze Co., Inc.—Pres., C. J. G. Fischer; Vice Pres., Louis Fischer;

Sec., A. Helmkl; Treas., Louis Fischer; Sales Mgr., Walter Glenn Scott; Production Mgr., J. J. Schiel; Adv. Mgr., Walter Glenn Scott; Representatives, C. J. G. Fischer, Louis Fischer, Walter Glenn Scott, J. J. Schiel, J. Parks. N. Y. Show Space, D-156; Chicago, 38 and 39.

Folberth Auto Specialty Co.—Pres., Fred G. Folberth; Vice Pres., Wm. M. Folberth; Sales Mgr., Carl J. DeWitt. N. Y. Show Space, D-103; Chicago, 206-208, inclusive, Coliseum Annex.

H. H. Franklin Mfg. Co.—Engineer, L. M. Stellmann; Sales Mgr., S. E. Ackerman; Adv. Mgr., H. H. Goodhart. N. Y. Show Space, A-26; Chicago, B-6.

Fulton Co.—Pres., J. F. Hartz; Sec., W. F. Ankian; Mgr., G. A. Maher; Sales Mgr., W. A. Bell. Chicago Show Space, 13.

Gardner Governor Co.—Pres., J. W. Gardner; Sec. and Treas., R. G. Gardner; Dist. Sales Mgr., Robert A. Kiefer; Gen. Sales Mgr., F. T. Wells; Eastern Distributor, Stephen V. Morrin; Representatives, Robert A. Kiefer, Stephen V. Morrin. N. Y. Show Space, D-190.

Gardner Motor Co., Inc.—Pres., Russell E. Gardner; Vice Pres. of Sales, Russell E. Gardner, Jr.; Vice Pres. of Production, Fred W. Gardner; Sec., L. A. Moore; Treas., E. H. Buhle; Engineer, E. A. Weber; Sales Mgr., W. H. Yeldell; Production Mgr., Fred W. Gardner; Adv. Mgr., W. H. Yeldell. N. Y. Show Space, A-29; Chicago, B-1.

Gates Mfg. Co.—Pres., F. E. Gates; Sales Mgr., E. H. Habig; Production Mgr., F. O. Lane. N. Y. Show Space, D-72; Chicago, 97, Coliseum Annex.

General Electric Co.—Representatives, L. W. Shugg, R. E. Russell, B. C. Bowe, K. B. Jones, C. T. McLoughlin, J. H. Stuart, W. C. Earle. N. Y. Show Spaces, D-222 and 223; Chicago, 2 and 3.

General Safety Signal Co.—Pres., Wm. McManus; Sales Mgr., Wm. D. Johnson. N. Y. Show Space, 57-D.

Giant Grip Mfg. Co.—Mgr., H. B. Osgood; Sales Mgr., Otto Kaufman; Representatives, W. A. Harmon, F. J. Shultis, Jr., Otto Kaufman, H. B. Osgood, C. J. Parker. N. Y. Show Space, C-39; Chicago, 46.

Gill Mfg. Co.—Pres., E. P. Chalfont; Gen. Mgr., E. J. Smith; Sec., W. S. Keefe; Sales Mgr., W. J. Ford. N. Y. Show Space, C-34; Chicago, 159-162, Coliseum Annex.

Globe Mfg. Co.—Mgr., H. M. Dunlap; Engineer, D. M. Putnam; Asst. Mgr., M. R. Kyrell; Representative, John E. Brandon. N. Y. Show Space, D-116; Chicago, 1 and 2.

Grand Rapids Brass Co.—Eastern Sales Mgr., B. A. Hinman; Sales Dept., Donn Wilkins. N. Y. Headquarters, 7 E. 42nd St.

Grant Motor Car Corp.—Vice Pres., Geo. C. Hubbs; Purchasing Agent, G. C. Starkweather; Engineer, J. W. Howe; Sales Mgr., Frank S. Stratton; Representatives, E. L. McFalls, F. F. Pernell. N. Y. Show Space, B-12; Chicago, H-1.

Graynys Corp.—Pres., Raymond K. Gray; Vice Pres., Malcom R. McNeill; Sec., Howard E. Haynie; Sales Mgr., H. P. Sommerfeld; Representatives, P. K. Gray, M. R. McNeill, H. P. Sommerfeld. Chicago Show Space, 2, Armory Gallery.

L. P. Halladay Co.—Pres., L. P. Halladay; Sec., H. W. Lakins; Treas., A. L. Halladay; Sales Mgr., W. J. Hemlecke; Production Mgr., E. R. Williams. N. Y. Show Space with Asch & Co.; Chicago, 104-105.

Handley-Knight Co.—Pres., J. I. Handley; Engineer, R. A. DeVlieg; Commercial Mgr., John Yoke; Asst. Coml. Mgr., D. B. Williams. N. Y. Show Space, C-9; Chicago, L-1.

Hanson Motor Co.—Pres., Geo. W. Hanson; Engineer, E. W. Van Duzen; Sales Mgr., O. R. Randall; Adv. Mgr., O. R. Randall. N. Y. Show Space, C-15; Chicago, C-5, Armory.

Hartford Automotive Parts Co.—Pres., R. E. Carpenter; Engineer, D. L. Kallish; Sales Mgr., A. C. Chambers; Production Mgr., H. H. Edge. N. Y. Show Space, C-107; Chicago, 36.

Edward V. Hartford, Inc.—Pres., Edward V. Hartford; Vice Pres., A. Waterman; Sales Mgr., Henry Roemer; Representatives, A. Waterman, Henry Roemer. N. Y. Show Space, C-43; Chicago, 74, Gallery.

Hayes Mfg. Co.—Pres., Hal H. Smith; Vice Pres., C. E. Drum; Sec. and Treas., H. P. Carrow; Sales Mgr., E. D. Emmons; Asst. Sales Mgr., B. M. Pheatt. N. Y. Show Space, C-35-37; Chicago, 61-62-67-68.

Haynes Automobile Co.—Pres., Elwood Haynes; Vice Pres. and Gen. Mgr., Alton G. Seiberling; Sec. and Treas., A. E. Starbuck; Chief Engineer, Frank N. Nutt; Gen. Sales Mgr., Wm. Elliott Phelps; Production Mgr., W. R. MacConnell; Director of Adv., Gilbert U. Radoye. N. Y. Show Space, A-7; Chicago, F-3.

H. C. S. Motor Car Co.—Pres., H. C. Stutz; Sec., A. G. Murdock; Treas., H. F. Campbell; Adv. Mgr., and Sales Mgr., G. H. Ford; Representatives, H. C. Stutz, C. C. Merz, G. H. Ford, E. A. Martin. N. Y. Show Space, B-10; Chicago, M-2.

Heald Machine Co.—Vice Pres. and Treas., J. N. Heald; Sales Mgr., S. T. Massey; Representatives, J. N. Heald, S. T. Massey, L. C. Kenyon, H. E. Ollivier, G. A. Jabst, Wm. Edes, R. A. St. John.

Hera, Inc.—Pres., G. L. Herz; Vice Pres., B. W. Randolph; Treas., Ely Bernays; Engineer, G. L. Herz; Sales Mgr., L. E. Gensler; Adv. Mgr., H. C. Hilder; Representatives, G. L. Herz, Ely Bernays, B. W. Randolph, L. E. Gensler, J. C. Hilder. N. Y. Show Space, C-53.

Holmes Automobile Co.—Pres., Arthur Holmes; Sec., Geo. W. Belden; Treas., Arthur Holmes; Engineer, H. B. Massey; Asst. Sales Mgr., G. H. Paddock. N. Y. Show Space, B-13; Chicago, B-3, Armory.

George L. Holmes—Representatives, George L. Holmes, Chas. R. Colburn, C. W. Finch. N. Y. Show Space, D-49 and 50.

Holophane Glass Co.—Engineer, Davis H. Tuck; Sales Mgr., Chas. Franck. N. Y. Show Space, D-151.

Hudson Motor Car Co.—N. Y. Show Space, Hudson Cars, A-14; Essex, C-11; Chicago, D-3.

Hupp Motor Car Corp.—Pres., Chas. D. Hastings; Vice Pres., D. Young; Sec. and Vice Pres., A. Von Schlegell; Treas., A. Von Schlegell; Engineer, F. E. Watts; Sales Mgr., O. C. Hutchinson; Production Mgr., D. Young; Adv. Mgr., F. Dickinson. N. Y. Show Space, A-31; Chicago, B-5, Coliseum.

Imperial Brass Mfg. Co.—Vice Pres., W. A. Leonard; Engineer, W. J. Rudolph; Mgr. Oxy-Acetylene Dept., W. S. Noyes; Mgr. Automotive Dept., J. T. Greenlee; Adv. Mgr., Chas. Eckert Young. Chicago Show Space, 94.

Indiana Piston Ring Co.—Sec., Chas. N. Tutor; Engineer, Chas. N. Tutor; Sales and Adv. Mgr., L. Tutor; Production Mgr., George Keagy. Chicago Show Space, 13, Coliseum Basement.

Jefferson Forge Products Co.—Vice Pres. and Gen. Mgr., C. E. Wade; Engineer, J. L. Carey; Sales Mgr., C. H. Brennan. N. Y. Show Spaces, C-74 and 75; Chicago, 85.

Johnson Automobile Lock Co.—Pres., E. McMullen; Vice Pres., J. C. Schott; Treas., J. F. Hoffmann; Engineer, C. L. Johnson; Salesmen, T. J. Candle, F. Wice. N. Y. Show Space, D-187 and 188; Chicago, 75.

Jon-Con Tire Protector Co.—Sales Mgr., G. R. Conover; Production Mgr., J. C. Clymer. N. Y. Show Space, D-143.

Jordan Motor Car Co.—Pres., Edward S. Jordan; Sec., Paul Zens; Engineer, R. S. Begg; Sales Mgr., W. B. Riley; Production Mgr., J. H. Kelly; Adv. Mgr., W. B. Riley; Representatives, W. B. Riley, Ralph A. O'Reilly, Wm. Gallagher. N. Y. Show Space, A-6; Chicago, F-5.

Kant Rust Products Corp.—Pres., William F. Veech; Sec., L. G. Beatty; Treas., I. M. Custer; Sales Mgr., Wm. F. Veech; Salesmen, Jas. G. Robinson, D. L. Conklin. New York Show Space, D-140; Chicago, 33.

Kant-Skore Plaston Co.—Vice Pres., Geo. D. Armstrong; Asst. Sec., L. C. Magee; 2nd Vice Pres., Leon A. Hallstead. N. Y. Show Space, D-19; Chicago, 75 and 76.

I. Kellermann—Representative, E. J. Kellermann. N. Y. Show Space, D-119; Chicago, 86, 87 and 88.

Kelso Mfg. Co.—Pres., J. Russell Kelso, Sr.; Sec., J. Russell Kelso, Jr. N. Y. Show Space, C-83.

Kentucky Wagon Mfg. Co.—Pres., Robt. V. Board; Vice Pres., S. K. Miller; Engineer, J. F. Murphy; Sales Mgr., S. K. Mil-

ler; Adv. Mgr., C. V. Franks; Representatives, Robt. V. Board, S. K. Miller, Geo. H. Lloyd, E. Palmer, Geo. Selbert, O. N. McCool, A. J. Karsner, J. F. Murphy, C. V. Franks. N. Y. Show Space, C-19; Chicago, B-4, Armory.

King Motor Car Co.—Pres., A. Weber; Director of Sales, W. C. Hood; Sales Mgr., H. Alperin; Asst. Sales Mgr., R. M. Hutchinson. N. Y. Show Space, C-3; Chicago, B-5.

Kissell Motor Car Co.—Pres., G. A. Kissell; Sec., W. L. Kissell; Sales Mgr., J. F. Lynch; Adv. Mgr., Ralph Kaye. N. Y. Show Space, B-17; Chicago, Q-3.

Kline Car Corp.—Vice Pres. and Gen. Mgr., J. A. Kline; Sec. and Treas., W. H. Warren; Engineer, J. P. Harbald; Sales Mgr., Geo. D. Gravelly; Production Mgr., J. P. Harbald; Adv. Mgr., J. A. Kline. N. Y. Show Space, C-11.

Kollmorgen Optical Corp.—Pres., Chas. Kaiser; Vice Pres., F. Kollmorgen; Sec., Fred Kaiser; Treas., George Haase; Engineer, Ivan Anderson; Sales Mgr., O. B. Keller; Production Mgr., George Mertel; Representatives, Ivan Anderson, Chas. Abrahams. N. Y. Show Space, D-138.

Kraemer & Co.—N. Y. Show Space, D-109; Chicago, 29.

Laduna Products Co.—Engineer, J. P. Nikonow; Commercial Representative, Fred A. Smith. N. Y. Show Space, 199.

La Fayette Motors Co.—Vice Pres. and Sec., E. C. Howard; Vice Pres. and Treas., D. F. Edwards; Adv. Mgr., Leo N. Burnett; Sales Rep., Edward Tucker, Jr.; Sales Dept., Chauncey R. Hood. N. Y. Show Space, B-8; Chicago, E-3.

La-Le Chemical Co.—Pres. and Treas., J. P. Thompson; director, Frank S. Hunt; Lubricating Engineer, H. M. Unrath; Sec., J. U. Edgren. New York Sales Mgr., H. MacGinley; Asst. N. Y. Sales Mgr., P. W. Mable. N. Y. Show Space, D-23.

Landies Tool Co.—Engineer, S. S. Shoemaker; Sales Mgr., T. H. King; N. Y. Mgr., M. G. Dunbar; Representative, W. H. Swigert. N. Y. Show Space, D-110; Chicago, 70 and 71, basement.

Lane Bros. Co.—N. Y. Show Space, D-133 and 108; Chicago, D-103 and 105.

Geo. E. LaVietes Co.—Pres., Geo. E. LaVietes; Sec., M. T. LaVietes. N. Y. Show Space, D-107.

Le Compte Co.—Representative, H. Y. Hooper, Jr.; Sales Mgr., J. E. Buck; Credit Mgr., R. E. Byrne; Purchasing Agt., W. S. Marcus; Salesmen, H. M. Swartz, F. Stephenson. N. Y. Show Space, D-125.

Lexington Motor Co.—Pres., Frank B. Ansted; Vice Pres., C. C. Hanch, Fred I. Barrows; Sec. and Treas., L. A. Haason; Engineer, John C. Moore; Sales Mgr., R. T. Middleton; Production Mgr., C. C. Hanch; Adv. Mgr., Emery Huston; Distributors, Harry W. Gaston, Oscar T. Mitchell. N. Y. Show Space, A-18; Chicago, B-3.

Liberty Motor Car Co.—Pres., Percy Owen; Sec., D. E. Williams; Engineer, G. B. Allen; Sales Mgr., J. E. Fields; Production Mgr., E. A. Taylor; Adv. Mgr., Reta B. Coleman. N. Y. Show Space, B-23; Chicago, G-2.

Light Mfg. & Foundry Co.—Pres., E. S. Fretz; Sec. and Treas., E. R. Cassell; Engineer, F. C. Morrison; Sales Mgr., L. W. Blauman; Production Mgr., T. L. Rutter; Procurement Dept., H. V. Slawter. N. Y. Show Space, C-52.

Lincoln Motor Co.—Pres., H. M. Leland; Vice Pres., W. C. Leland; Sec. and Treas., W. T. Nash; Engineer, E. E. Sweet; Sales Mgr., R. C. Getsinger; Adv. Mgr., K. P. Drysdale. N. Y. Show Space, A-5; Chicago, 8-3.

Locomobile Co.—Pres., E. H. Havens; Sales Mgr., E. A. Travis. N. Y. Show Space, B-24; Chicago, H-2.

David Lupton's Sons Co.—Vice Pres., Clarke P. Pond; Engineer, C. R. Harrison; Sales Mgr., E. H. Spears. Chicago Show Spaces, 9 and 10, Balcony, First Regiment Armory.

Lyons Mfg. Co.—Pres., George W. Lyons; Vice Pres., Willard R. Carroll; Sec. and Treas., Ernest Gregory. N. Y. Show Space, 122.

McFarlan Motor Corp.—Pres., A. H. McFarlan; Sales Mgr., P. F. Barrows; Representatives, Winfield Graham, Geo. Bux-

ton. N. Y. Show Spaces, B-20 and 691; Chicago, B-7 and 660.

McQuay-Norris Mfg. Co.—Vice Pres., L. A. Safford; Branch Mgrs., R. W. Long, P. K. Westmoreland, A. D. Legg, L. H. Dally; Factory Representatives, A. K. Neilson, R. D. Rowland, E. E. Anderson, A. H. Habich. N. Y. Show Space, D-66 and 67; Chicago, 148-153.

John L. Madsen—Pres., J. L. Madsen. N. Y. Show Space, D-79.

Malbohm Motors Co.—Pres., H. C. Malbohm; Treas., W. J. Corr; Sales Mgr., T. W. Cushing; Asst. Sales Mgr., W. W. Jeffrey; District Sales Mgrs., O. L. Curtis, W. V. Burnett, A. H. Reber, H. R. Smith. N. Y. Show Space, B-19; Chicago, E-1.

Manley Mfg. Co.—Pres., Robert E. Manley; Engineer, F. M. Stonebough; Sales Mgr., H. M. Smith. N. Y. Show Spaces, D-38 and 39; Chicago, 52-55.

Marko Storage Battery Co.—Pres., Paul M. Marko; Sales Mgr., H. G. Anschuetz; Adv. Mgr., Thos. Brady; Representatives, H. G. Anschuetz, Charles Tate, John L. Hart. N. Y. Show Space, D-205.

Maxwell Motor Sales Corp.—Vice Pres., A. E. Barker; Director of Sales, J. J. Plath; Adv. Mgr., W. J. Mattimore. N. Y. Show Space, A-9; Chicago, E-2.

Mercer Motors Co.—Vice Pres., T. E. A. Barthel; Sec. and Treas., T. E. A. Barthel; Engineer, J. P. Oliveau; Sales Mgr., W. A. Smith; Production Mgr., J. W. MacMorris; Asst. Sales Mgr., C. H. Saidt. N. Y. Show Spaces B-2; Chicago, M-1.

Metal Stamping Co.—Pres., J. F. Galvin; Vice Pres., J. F. Galvin, Jr.; Engineer, G. A. Lyon; Sales Mgr., R. A. Picard; Production Mgr., F. H. Korff. N. Y. Show Spaces, D-191 and 192; Chicago, 100 and 101.

Michigan State Auto School—Pres., A. G. Zeller; Business Counsel, T. P. Myers; Asst. Mgr., E. W. Beatty; Dir. Edu. Exten., H. M. Rugg; Tractor Dept., M. J. Shipley; Adv. Mgr., R. A. Carter. N. Y. Headquarters, Pennsylvania and Commodore Hotels; Chicago Show Space, 13; Gallery, 1st Regiment Armory.

Midwest Engine Co.—Vice Pres., Lon R. Smith; Sales Engineer, Mark A. Smith; Sales and Research Eng., P. J. Dasey; Chief Engineer, C. R. Schuler. N. Y. Show Space, C-38; Chicago, 39 and 40, Coliseum Gallery.

Milburn Wagon Co.—Vice Pres., Otto Marx; Sales Manager, R. S. Woodhull; District Sales Mgrs., K. A. Rid-nour, R. A. Potts, B. B. Hood, E. L. Hoffman; Chief Engineer, Karl Probst. N. Y. Show Space, B-5; Chicago, E-4.

Miller Auto Supply Co.—Representatives, Morris Miller, Jos. Fink, John M. Cody, Joseph Sacks, H. J. Whitelan; Sales Mgr., Jack J. Guttman. N. Y. Show Space, D-148.

Millers Falls Co.—General Sales Mgr., George U. Hatch; Salesman, Chester M. Heath; District Sales Manager, Roger L. Bracken. N. Y. Show Space, D-56.

Milwaukee Tank Works—Branch Mgrs., N. R. Bemm, W. C. Gibson; Sales Mgr., M. Reilly. N. Y. Show Space, D-113; Chicago, 65.

Mitchell Motors Co.—Pres., W. L. Jacoby; Gen. Sales Mgr., John Tainsh; Chief Engineers, P. J. F. Battenburg and H. M. Pulsifier; Asst. Sales Mgr., G. N. Bliss. N. Y. Headquarters, Commodore Hotel; Chicago, Congress Hotel.

Monarch Metal Products Co.—Pres., Alfred M. Lane; Sales Mgr., W. V. Lane. Chicago Show Spaces, 77 and 78.

Moon Motor Car Co.—Pres., Stewart McDonald; Engineer, Geo. H. Kublin; Sales Mgr., F. H. Renger; Production Mgr., Geo. F. Heising; Adv. Mgr., N. E. McDarby. N. Y. Show Space, B-9; Chicago, E-4.

Moto-Meter Co., Inc.—Sales Mgr., E. V. Hennecke; Adv. Mgr., C. B. Stetson. N. Y. Show Space, C-26; Chicago, 30 and 31.

Naperville Machine Co.—Pres., H. C. Urbauer; Sec. and Sales Mgr., H. J. Matter. Chicago Show Space, 99, Coliseum Basement.

Nash Motors Co.—Pres., C. W. Nash; Export Sales Mgr., J. A. Rose; Sales Mgr., C. B. Voorhis; Adv. Mgr., E. J. Travers. N. Y. Show Space, A-30; Chicago, C-1.

National Seal Co., Inc.—Vice Pres., Nixon Lee; Sec. and Treas., Paul Muller; Sales

Mgr., Paul Muller; Representatives, Paul Muller, Nixon Lee, R. L. McIntyre. N. Y. Show Spaces, D-104 and 105; Chicago, 14 and 15.

Ner-A-Car Corp.—Pres., J. Allen Smith; Representatives, E. K. Gordon, E. B. Sigerson, J. Allen Smith, Jr. N. Y. Headquarters, Hotel Commodore; Chicago Show Space, 46.

No-Leak-O Piston Ring Co.—Pres., J. E. Norwood; Treas., L. G. Matthews; Sales Mgr., G. W. Harkrader; Representatives, L. E. Malican, F. J. Holmes, F. B. Archibald, H. L. Strasburger, W. M. Harkrader, T. A. Wensink, Theo. Rowe. N. Y. Show Space, D-129; Chicago, 37.

Nordyke & Marmon Co.—Pres., W. C. Marmon; Vice Pres., F. E. Moskovics; Treas., H. H. Purdy; Sec., H. H. Rice; Engineer, C. E. Jeffers; Sales Mgr., H. H. Brooks; Adv. Mgr., A. J. Rogers. N. Y. Show Space, A-21; Chicago, F-4.

Norton Co.—Sales Mgr., Howard W. Dunbar; District Mgr., H. N. Cudworth; Representative, H. M. Harding. N. Y. Show Spaces, D-130 and 131; Chicago, 179-182, inclusive.

Oakland Motor Car Co.—Pres., Geo. H. Hannum; Sales Mgr., C. J. Nephler; Asst. Sales Mgr., W. R. Tracy; Engineer, B. Jerome; Representatives, Chas. M. Brown, L. J. Brooking. N. Y. Show Space, A-17; Chicago, A-2.

Olds Motor Works—Pres., A. B. C. Hardy; Engineer, Robert K. Jack; Sales Mgr., Guy H. Peasley; Production Mgr., John Scott; Adv. Mgr., E. J. Shassberger; Zone Managers, F. A. Gross, W. E. Betts; Show Director, E. J. McMullen; Chassis Lecturer, A. S. Taylor. N. Y. Show Space, A-13; Chicago, C-6.

Packard Engineering Co.—Pres., Warren Packard; Vice Pres., W. R. Davis; Production Mgr., E. K. Reese. N. Y. Show Spaces, D-68 and 69; Chicago, 81.

Packard Motor Car Co.—Vice Pres. of Distribution, H. H. Hills; Sales Mgr., R. E. Chamberlain; Adv. Mgr., R. D. Hughes. N. Y. Show Space, A-5; Chicago, D-2.

Paige-Detroit Motor Car Co.—Pres., H. M. Jewett; Vice Pres., F. L. Jewett; Engineer, A. Bachle; Sales Mgr., H. Krohn; Adv. Mgr., W. K. Towers. N. Y. Show Space, A-4; Chicago, D-5.

Parko Mfg. Co., Inc.—Vice Pres., James G. Rishor; Sales Mgr., M. C. Roberts. N. Y. Show Space, D-43; Chicago, 84.

P. & F. Auto Supply Co., Inc.—Pres., Wm. H. Pederson; Sec. and Treas., A. S. Flanagan. N. Y. Show Space, D-73.

Perfection Heater & Mfg. Co.—Vice Pres. and Gen. Mgr., C. S. Pelton; Sales Engineer, S. B. Rose; Equipment Sales Mgr., E. L. Jones; Manager of Distributors Sales, H. P. McWilliams. N. Y. Show Space, D-95; Chicago, 211 Coliseum Annex.

Philadelphia Storage Battery Co.—Pres., Edward Davis; Vice Pres., J. M. Skinner; Sec., E. G. Peyton; Treas., J. S. Thomas; Engineer, D. I. Pierson; Sales Mgr., W. S. Crammer; Production Mgr., G. O. Deming; Adv. Mgr., C. L. Elliott. N. Y. Headquarters, 41 E. 42nd St.; Chicago, 6121 S. Michigan Ave.

Pilot Motor Car Co.—Pres., George E. Seidel; Purchasing Agent, Frank X. Stenger; Sales Mgr., Jos. W. Connor; Production Mgr., Herb. Van Etten; Adv. Mgr., Helm E. Walker; Supervisor of Branches, J. V. Rowan; Mgrs., H. DeLong, George F. Bates. N. Y. Show Space, C-7; Chicago, E-3.

Porter Electric Carburetor, Inc.—Pres., Alexander W. Porter; Vice Pres., Frank W. Skinner; Sec. and Treas., LeRoy R. Corwin; Engineer, Alexander W. Porter. N. Y. Show Space, D-186; Chicago, 208, Coliseum Annex.

Premier Motors Corp.—Pres., John A. Pricu; Vice Pres., M. A. Whipple; Sec. and Treas., I. Schaeffr; Engineer, A. L. Nelson; Sales Mgr., H. E. Doty; Production Mgr., E. F. Theis. N. Y. Show Space, B-15; Chicago, A-2.

Protex Signal Co.—Sec. and Treas., Vernon Kroehle; Factory Representative, S. T. Shields; Chicago Distributors, H. C. Fraser, Harvey B. Stout. N. Y. Show Space, D-78; Chicago, 15.

Pyrene Mfg. Co., Inc.—Sales Mgr., G. P. Rogers. Headquarters for N. Y. and Chicago, Pyrene Offices.

Rajo Motor Co.—Adv. Mgr., Joe Jagersberger; Chicago, Coliseum.

Recording Devices Co.—Pres., H. G. Dieffendorf; Purchasing Agent, E. J. Kleist; Sales Mgr., D. J. Murnane; Consulting Engineer, J. P. Lavigne. N. Y. Show Space, D-167; Chicago, 42.

Reo Motor Car Co.—Sales Mgr., R. C. Rueschow; Asst. Sales Mgr., W. C. Parker; Adv. Mgr., D. B. McCoy. New York Show Space, A-3; Chicago, C-2.

Rex Mfg. Co.—Pres., C. C. Hull; Vice Pres., M. L. Hull; Salesmen, H. L. Mumford, J. W. Richman; Factory Mgr., M. R. Hull; Sales Mgr., R. H. Crawford. N. Y. Show Spaces, D-225 and 226; Chicago, 175-177, inclusive.

Rickenbacker Motor Co.—Pres., B. F. Everitt; Vice Pres., E. V. Rickenbacker; Sec. and Treas., H. L. Cunningham; Engineer, E. R. Evans; Sales Mgr., W. J. Drumplemann; Production Mgr., C. M. Tichenor; Adv. Mgr., W. J. Drumplemann. N. Y. Show Space, D-729; Chicago, Elizabeth Room, Congress Hotel.

Rimco Lubricator Co.—Pres., W. Gagnon; Treas., Walter E. Brown. N. Y. Show Space, D-76.

Geo. H. Rives Mfg. Co., Inc.—Vice Pres., Geo. H. Rives; Sec., A. E. Winkler. N. Y. Show Space, D-55.

R & V Motor Co.—Adv. Mgr., Roy A. Sears. N. Y. Show Space, B-21; Chicago, A-6.

Ryser Machine Works—Pres., Walter Ryser; Sec., G. Crenitz; Sales Mgr., E. P. Ekman; Production Mgr., Edw. Mack; Adv. Mgr., E. P. Ekman. Chicago Show Spaces, 5 and 6, Coliseum Basement.

Safetee Glass Co.—Sales Mgr., C. A. McCusker; Representatives, J. S. Concannon, J. T. Ross. N. Y. Show Space, C-78; Chicago, 6, Gallery.

Safstrom Mfg. Co.—Representatives, Gust. A. Safstrom, W. J. McDonough. Chicago Show Space, 78, Coliseum Gallery.

Saxon Motor Car Corp.—Pres., C. A. Pfeiffer; Vice Pres., H. L. Bill; Sec., D. C. Bayne; Sales Mgr., C. H. Becker; Service Mgr., J. H. Hickey. N. Y. Show Space, B-11; Chicago, E-2.

Sayers & Scoville Co.—Gen. Mgr., E. E. Hess; Vice Pres., F. F. Scovill; Engineer, F. J. Suesz; Sales Mgr., C. A. Eisenhardt; Purchasing Agent, W. Lang. N. Y. Show Space, C-14; Chicago, B-6.

Schaap Co.—Pres., E. C. Schaap, Jr.; Vice Pres., A. K. Schaap, Sr.; Sec. and Treas., A. K. Schaap, Jr.; Engineer, Robt. L. Schaap; Sales Mgr., Oswald C. Morin; Production Mgr., Walter S. Schaap; Adv. Mgr., E. J. Maxwell. N. Y. Show Space, 152.

A. Schrader's Son, Inc.—Pres., M. C. Schweinert; Vice Pres., P. G. Cole; Sec., W. T. Hunter, Jr.; Treas., H. P. Kraft. N. Y. Show Space, C-31; Chicago, 19-29.

Sedgwick Sales Co.—Pres., Edw. R. Poerschke, Jr.; Sec., I. H. Parke; Treas., Harold Gileland; Sales Mgr., Alfred Meyer; Adv. Mgr., O. G. Carpenter. N. Y. Show Space, D-84; Chicago, 33 and 34.

Sewell Cushion Wheel Co.—Pres., H. J. Sewell; Vice Pres., John H. Hammes; Treas., Walter T. Sewell; Adv. Mgr., E. O. Bodkin. N. Y. Show Space, C-82; Chicago, 10, Coliseum Gallery.

H. B. Shonts Co., Inc.—Pres., H. B. Shontz; Engineer, Henry Meyers; Sales Mgr., W. H. Girdlestone. N. Y. Show Spaces, D-117 and 118.

H. A. Shunk, Inc.—Pres., H. A. Shunk; Sec. and Treas., P. W. Giannini; Engineer, Thomas Sheehan; Sales Mgr., A. T. Brandmeier; Production and Adv. Mgr., P. W. Giannini. N. Y. Show Space, D-85.

Simplex Corp.—Pres., Frank R. Warren; Vice Pres., Charles Hendy, Jr.; Sec., John R. Warren; Treas., Frank R. Warren; Engineer, D. S. Paden; Sales Mgr., H. F. Hoover. N. Y. Show Space, D-40; Chicago, 9.

Sinclair Miller Corp.—Pres., N. R. Sinclair; Vice Pres. and Director of Sales, H. A. Goddard; Treas., E. R. Mulcock; Sales Mgr., H. A. Goddard. N. Y. Show Space, D-174 and 175.

Joseph N. Smith & Co.—Pres., E. L. Ackerman; Engineer, C. P. Chamberlin;

Sales Mgr., C. T. Fezkey. N. Y. Show Space, C-76; Chicago, 38.

Sparks-Withington Co.—Vice Pres., Wm. Sparks; Representatives, H. G. Sparks, C. M. Sparks, J. Billet, Mr. Billingshurst and Mr. Billantine. Headquarters for N. Y., Astor Hotel; Chicago, Congress or Blackstone Hotel.

Standard Steel Car Co.—Pres., J. M. Hansen; Vice Pres., R. L. Gordon; Engineer, A. W. Frehse; Sales Mgr., W. A. Morrow; Representatives, W. A. Morrow, E. C. Johnson, H. Holtom, F. Spring, P. G. Jenks. N. Y. Show Space, B-22; Chicago, A-8.

F. B. Stearns Co.—Vice Pres., Paul M. Bokey; Sales Mgr., Geo. L. Bokey. N. Y. Show Space, B-26; Chicago, H-1.

Stephens Motors Works, Moline Plow Co.—Gen. Mgr., H. J. Leonard; Sales Mgr., C. R. Clough; Asst. Sales Mgr., W. A. Biss, Jr.; Production Mgr., C. E. McCool. N. Y. Show Space, B-27; Chicago, F-1.

Stevens-Duryen, Inc.—Pres., Ray S. Deering; Vice Pres., Geo. M. Berry; Sec. and Treas., Marion R. Leathers; Engineer, John G. Perrin; Sales Mgr., P. W. Hine; Production Mgr., John Turcott; Adv. Mgr., P. W. Hine. N. Y. Show Space, C-5; Chicago, E-5.

Stromberg Motor Devices Co.—Pres., C. W. Stiger; Vice Pres., W. L. O'Neill; Sec., M. K. Kirk; Engineer, F. C. Mock; Sales Mgr., W. L. O'Neill; Production Mgr., C. J. Gustafson; Adv. Mgr., R. E. Stuntz. N. Y. Show Spaces, C-64 and 65; Chicago, 57 and 72.

Studebaker Corp.—Pres., A. R. Erskine; Vice Pres., H. A. Biggs, L. J. Ollier, M. J. Wollering; Engineer, Guy P. Henry; Sales Mgr., H. B. Harper; Asst. Sales Mgr., Geo. W. Sweet; Adv. Mgr., M. A. Hollinshead; Representatives, M. A. Hollinshead, F. K. McCune. N. Y. Show Space, A-15.

Stuts Motor Car Co. of America, Inc.—Pres., W. N. Thompson; Service Mgr., W. A. Weldely; Sales Mgr., F. E. Wilson; Adv. Mgr., Steve Hannagan; Purchasing Agt., E. T. Klee; Chairman of Board, Allan A. Ryan. N. Y. Show Space, B-28; Chicago, O-2.

Sun Company—Mgr. Motor Oil Dept., C. H. Bristol; Dist. Sales Mgr., N. Y. C., F. J. Coffin; Representative, E. M. Ong; Dist. Sales Mgr., Chicago, E. W. Teagle. N. Y. Show Space, C-41; Chicago, 97.

Sunderman Corp.—Vice Pres., F. R. Sunderman; Sales Mgr., G. O. Starr; Representatives, J. R. Flanagan, F. M. Fenner, C. M. Robb, W. M. Ross. N. Y. Show Space, D-29; Chicago, 76, Coliseum Gallery.

Tanners Council—Representative, John R. Arnold. N. Y. Show Space, D-214-219; Chicago, 22-26 and 47-51.

Templar Motors Co.—Pres. and Gen. Mgr., M. F. Bramley; Engineer, A. M. Dean; Sales Mgr., Paul E. Ryan; Adv. Mgr., M. Blieweiss. N. Y. Show Space, B-31; Chicago, A-4.

Tonneau Shield Co., Inc.—Pres., Theo. B. Nisbet; Sec., Harold B. Abrams. N. Y. Show Spaces, D-96 and 97; Chicago, 79.

Trexler Co.—Pres., S. W. C. Trexler; Vice Pres., H. J. Adair; Sec. and Treas., E. J. Flannery; Sales Mgr., George Blair. N. Y. Show Space, D-70; Chicago, 20.

Trindl Co.—Pres., J. H. Trindl; Sales Mgr., C. A. Heinze; Production Mgr., F. A. Trindl; Adv. Mgr., J. H. Trindl. Chicago Show Spaces, 82 and 83, Coliseum Basement.

U & J Carburetor Co.—Pres., F. A. Urwan; Vice Pres., L. B. Tebbetts; Sec., B. U. Hills; Treas., F. A. Urwan; Engineer, B. U. Hills; Sales Mgr., C. A. Kemper; Production Mgr., B. U. Hills; Adv. Mgr., C. A. Kemper. Chicago Show Space, 8.

U. S. Axle Co.—Pres., George C. Lees; Engineer, A. M. Yocom. N. Y. Show Space, C-88.

U. S. Compression Inner Tube Co.—Adv. Mgr., V. A. Smith; Sales Mgr., H. E. Harris; Representatives, L. F. George, D. V. A. Smith, J. T. Blake. N. Y. Show Space, D-86; Chicago, 32, Balcony, First Regiment Armory.

U. S. E. Corp.—Pres., R. T. Newton; Vice Pres., I. M. Upperco; Sec., S. H. Shaw; Treas., John Garman; Sales Mgr., S. H. Shaw. N. Y. Show Space, C-80.

Utica Compressor Co., Inc.—Pres., F. E.

Béck; Treas., C. A. Schmidt; Sales Mgr., T. B. Bergen. N. Y. Show Space, D-197.

Vacuum Oil Co.—Mgr., Russell Brown; Asst. Mgrs., E. F. Sweeney, W. H. Scott; Engineer, B. B. Mears; Western Division Mgr., W. W. Smith; Sales Mgr. Western Division, T. D. Luccock; Branch Mgr., R. E. Colcock; Engineer, M. Muller. N. Y. Show Spaces, C-103 and '14; Chicago, 63 and 64, Gallery.

Vauxhall Motors, Ltd.—Overseas Branch Mgr., A. B. Garrow; Sales Mgr., R. S. Dyball; Representative, J. R. Bishop. N. Y. Show Space, D-4-6.

Veeder Mfg. Co.—Pres., C. H. Veeder; Sec., H. W. Lester; Treas., D. J. Post; Engineer, H. J. Williams; Production Mgr., E. H. Crosby; Adv. Mgr., N. L. Bull; Representatives, R. L. Eddy, W. C. Waldo, B. H. Quinlan, P. J. Trieber, F. A. Bringolf. N. Y. Show Space, C-40; Chicago, 55.

Velle Motors Corp.—Pres., W. L. Velle; Vice Pres., F. E. Bradfield; Sec., W. L. Velle, Jr.; Engineer, C. B. Coy; Sales Mgr., T. G. Gannon; Production Mgr., L. H. Hazard; Adv. Mgr., H. T. Wheelock. N. Y. Show Space, A-25; Chicago, K-1.

Vibration Specialty Co.—Gen. Mgr., F. G. Hechler; Representatives, G. W. Klinger, W. H. Blessing. N. Y. Show Space, D-212; Chicago, 74, Coliseum Basement.

Walker Mfg. Co.—Pres., W. T. Walker; Vice Pres., W. H. Walker; Sec., H. R. Whirl; Representatives, J. H. Cooper, W. T. Walker, W. H. Walker, H. R. Whirl, W. H. Bretzlaff. N. Y. Show Space, D-102; Chicago, 172.

John Warren Watson Co.—Pres., John W. Watson; Treas., Richard Watson; Sales Representative, V. W. Don. N. Y. Show Space, C-17C; Chicago, 1, Coliseum Gallery.

Waukesha Motor Co.—Sec., H. L. Horning; Sales Mgr., F. P. Wilkins; Adv. Mgr., A. F. Fredricksen. N. Y. Show Space, C-93; Chicago, 47.

Weaver Mfg. Co.—Sec. and Sales Mgr., Chas. F. Hodgson; Special Representatives, Ralph Waldt, W. J. Whaley, A. B. Crawford. Headquarters at N. Y., Commodore Hotel.

Weidely Motors Co.—Vice Pres. and Chief Engineer, Geo. A. Weidely; Sales Mgr., B. F. Kelly. Chicago Show Spaces, 86 and 87.

Weldo Patch Mfg. Co.—Pres., Harris Greenberg; Sec. and Treas., David Schlactus; Sales Mgr., David Schlactus; Production Mgr., Robert Kaback; Adv. Mgr., Harry Ivans; Representatives, Harris Greenberg, David Schlactus, A. L. Greenberg, F. J. Broder. N. Y. Show Space, D-45.

Westcott Motor Car Co.—Pres., E. J. Westcott; Sec. and Treas., H. G. Root; Engineer, J. H. Tuttle; Sales Mgr., E. H. Gilcrest. N. Y. Show Space, B-23; Chicago, O-2.

Weston Electrical Instrument Co.—Sec., Caxton Brown; Sales Mgr., L. D. Joralemon; Adv. Mgr., J. Christian Vogel. N. Y. Show Space, C-101.

Wheeler-Schebler Carburetor Co.—Pres., D. F. Wheeler; Engineer, O. C. Berry; Sales Mgr., G. T. Briggs. N. Y. Show Space, C-49; Chicago, 32.

White Products Co.—Pres., J. F. White; Vice Pres., W. R. Drennan; Sales Mgr., S. A. Winsor. Chicago Show Space, 31.

S. S. White Dental Mfg. Co.—Engineer, F. L. Bailey; Sales Mgr., J. M. Talbot. Headquarters at Chicago, La Salle Hotel.

Wildenberg Brothers—Gen. Mgr., Joseph Wildenberg; Sec., V. H. Orenbach; Engineer, B. Z. Wildenberg; Sales Mgr., Jack Wildenberg; Production Mgr., Charles Wildenberg. N. Y. Show Space, D-149.

C. H. Wills & Co.—Pres., C. H. Wills; Vice Pres., J. R. Lee; Sales Mgr., E. C. Morse; Vice Pres. and Adv. Mgr., E. B. Alexander; Representatives, K. B. Alexander, E. C. Morse, W. M. Purves, J. Codd, J. D. Palmerlee, T. E. Dean, C. L. Jacobson, A. B. Jewett. N. Y. Show Space, C-16; Chicago, D-2, First Regiment Armory.

Willis-Overland Co.—Pres., John N. Willis; Executive Vice Pres., Walter P. Chrysler; Vice Pres., C. B. Wilson; Mgr. Manufacturing, W. H. Kilpatrick; Production Mgr., J. A. Sheldon; Engineer, E. H.

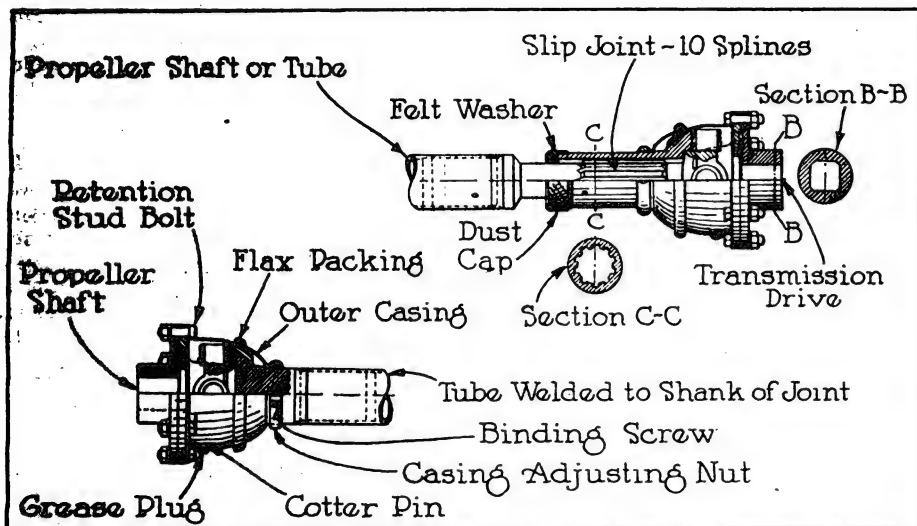
(Continued on Page 38.)

The Universal Joint

This Article Explains in Complete Detail Reason for Using—Principles of Construction—Also Gives Explicit Directions for Correct Servicing of Various Types.

(By E. E. RHODES, A. E.)

THE universal joint was early developed in the motor-driven passenger car to provide a means of transmitting the power of the engine to the rear axle for driving or turning the wheels so that the vehicle would be able to travel on the road. If all power vehicles were able to operate without springs or a straight line drive could be provided from the transmission to the rear axle pinion, the universal joint would not be needed. But springs are necessary for comfort and easy riding qualities in a car or truck and must be used. This brings up the question of angularity of drive, as the propeller shaft cannot, in good engineering practise, transmit the power of the engine in a straight line from the engine crank shaft to the axle pinion gear without causing excessive friction and preventing spring action.



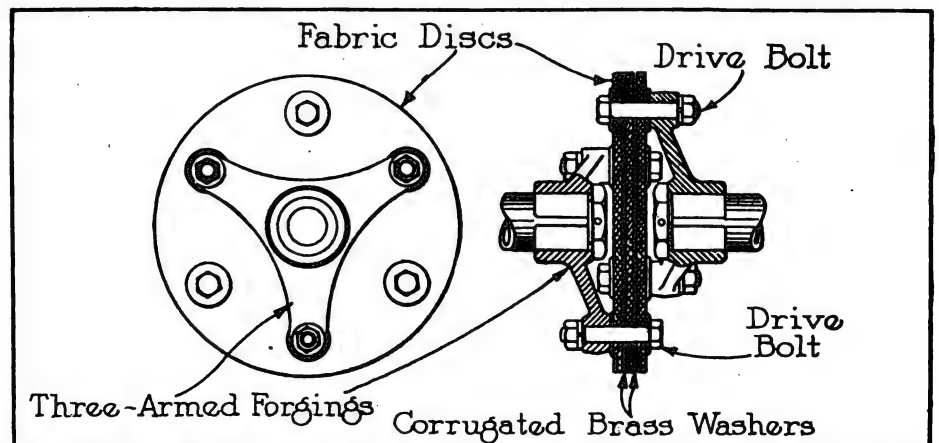
The Spicer Universal Joint, Protected Against Dust or Loss of Lubricant, May Consist of One or Two Joints, Splined or Fixed.

TO OVERCOME this difficulty and provide a means of transmitting engine power through one or more angles, the universal joint, as we know it today, was developed. In early vehicle construction this joint was known as a Cardan joint, named after its early inventor.

In present-day practise one or more joints are used, one in the rear of the transmission, attached to the main drive shaft at the rear of the transmission case and to the propeller shaft. A second joint also is used in many cars in front of the axle pinion, connecting the pinion shaft with the end of the propeller shaft and receiving the drive from the engine. Still other manufacturers confine their design to a single joint, covering the propeller shaft with a torque tube which protects the shaft and cares for the torque of the axle unit. The single universal joint provides for the angularity of the power transmission and the road action of the springs.

The universal joints of early design

were simple in construction, usually taking the form of two opposite forks



Fabric Disc Type Universal Joints Prove Popular with Passenger Car and Truck Manufacturers, as Their Use Allows a Certain Amount of Flexibility.

centered on a square block and fastened with pins through their common center. They were short-lived, required fre-

quent lubricating, were inclined to be noisy in operation and frequent renewals were necessary. To overcome these difficulties manufacturers have improved the design to an extent that universal joints at present operate noiselessly, when properly lubricated, from one year's end to another with no more trouble than would be experienced with any piece of machinery that has been brought to a high state of perfection. Lubrication is needed at intervals and provision is made in the design of the joint so that the oil is retained until exhausted. More over, new parts are easily obtained from the manufacturer and the work of renewal is reduced to a minimum by the simplicity of the design.

Popular Types of Universal Joints.

Among the most popular types in use at present are the Spicer, Arvac, Hartford and Blood. The Spicer joint, Figure 1, is similar in design to the well-known ring type, comprising a central ring having the pins forged integral with their axes in the same plane. One forked end is formed in a unit with a hub which bolts to the hub of the permanent shaft end, while the second fork may have either a short hub for permanent attachment to the propeller shaft or a long hub to provide for a slip joint. The bearing ends of the fork have an opening sufficiently large to permit inserting the pins, while they are also bored large enough to take hardened and ground bushings, which hold the ring and its pins in position. The bushings and forked ends have circular grooves cut in them so that a soft wire can be inserted to hold the bushings in place. A steel housing encloses the mechanism, which

also serves as a lubricant retainer, as well as a dust protector, and enhances the accessibility feature.

The Arvac universal joint differs from the above, consisting of a ball yoke and socket fitted with a cross block and pins enclosed in a forged steel housing. The housing supports two bushings, which provide bearings for the king pin, creating a light but strong driving member.

Shoulders Form Bearings.

The bushings, or bearings, which fit into the yoke have shoulders which form

locked in position by a locking pin. The two forks have bushings with the outer ends enclosed in caps which contain the lubricant.

Class A and B Motor Truck Joints.

The universal joint assembly, illustrated below, indicates the type of joint specified and used on Class A and B military trucks. This joint is essentially a pin type and follows accepted practise,

leather boot is attached to the propeller shaft and, with the housing, forms a lubricant retainer.

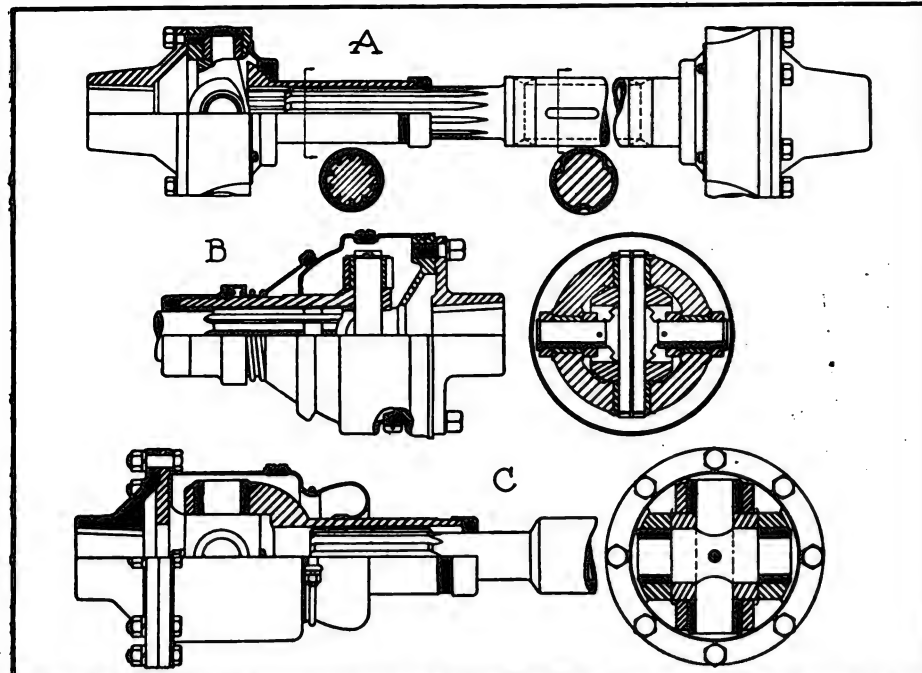
Universal joints of this type are adapted for use between the clutch, transmission and rear axle. In commercial vehicle design, where the transmission gear set is placed amidship, two universal joints are required to transmit the power to the rear axle. One of these joints must have a slip joint and is usually used as the front joint adjoining the transmission, compensating for the variations in shaft and frame lengths, and is also advantageous in assembling or disassembling.

Flexible Type Fabric Joints.

Fabric joints have been in use for some time because they present several features not obtainable with mechanical types. Their principle advantages are silent operation without wearing surfaces requiring lubrication. They also assist materially in starting heavy vehicles under load, allowing the engine to pick up easily by providing a small amount of slack which starts the load without jerking. They are used mostly between the engine clutch and the transmission, allowing a straight-line drive. Such a joint is shown on page 32, and is made up of several thicknesses of rubberized fabric with steel spacers between attached to three-armed staggered spiders which are keyed to the ends of the shaft.

Universal Joint Disassembly.

Specific instructions cannot very well be given for removing the universal joint from any special make of car or truck. However, by studying the instruction book and the cut shown of the clutch as used in the car, a fairly good idea of the proper place to start the operation of dis-



A, the Arvac Joint Provides a Light, Strong Driving Member, Which Is Very Popular; B, the Hartford Joint Is Dust and Oil-Proof, Simple in Construction and Easily Accessible; C, Special Type of Universal Joint Designed for Use on Class B Trucks.

bearings for the yoke pin. The bushings have oil grooves and the oblong space supplied by the housing make grease pockets, the grease being distributed by centrifugal force, this action forcing it into the oil grooves of the bushings. The pins are a press fit into the cross block, practically forming a one-piece driving member. The yoke end has a spherical surface which, with a special packing contained in a retainer forms a seal which holds the lubricant.

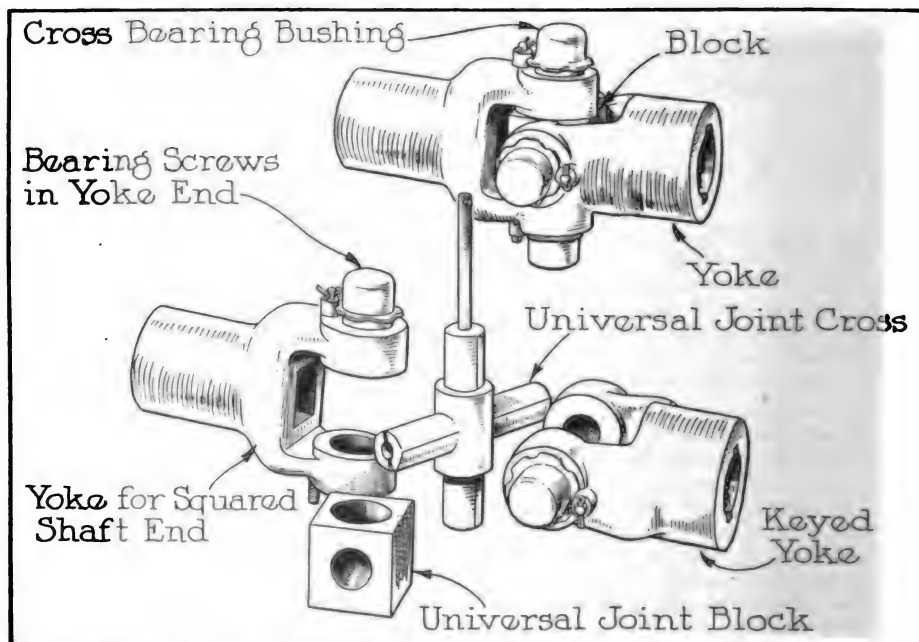
Hartford Pin Type.

The Hartford pin joint universal is of the type using one long and two short pins, and is related to the ring type in that a central ring is used which carries the bushings that form bearings for the pins. One fork end is forged integral with a hub which bolts to the hub of the permanent shaft end. This hub is fitted with lugs in the form of a clevis so that the load is placed on both ends of the pin instead of at one point. The long pin passes through both extensions of the yoke end and all pins are fastened with washers and cotter pins. The mechanism is enclosed in a pressed steel housing provided with packing to retain lubricant.

Blood Universal.

The Blood universal joint, of earlier design, is also of the pin type, but of open construction as no housing is provided. The joint consists of a central member in the form of a cube, which has a large and small pin, the latter passing through the cube and large pin and is

having a central cross into which the pins are pressed. In order to form a solid unit these parts are locked by a bolt



Block and Pin Type Joint Used When the Joint Is Left Uncovered or Protected by Leather Grease Boot.

which passes through them. The pin pivots are hardened and ground steel bushings and are pressed into the fork and flange yoke, forming bearings for the pins. The entire assembly is enclosed in a pressed steel housing, while a

assembling can be gained by placing the stud bolts, pins and other parts loosely in the openings from which they were removed in disassembling, much time can be saved in finding and fitting these when reassembling the joint.

Expert Discusses Motor Car Productive Capacity

Sufficient to Double Number of Vehicles Now in Use, Says Banker—Thinks Country Cannot Utilize All of Present Factory Facilities—Interesting Deductions from Statistics of Automobile Industry Since Its Inception

“UNLESS exports of cars increase enormously, it appears that the present productive capacity of the industry would be sufficient nearly to double the number of cars in use within the next few years.”

This is one of the interesting deductions made by Leonard P. Ayres, vice president of the Cleveland Trust Co., Cleveland, O., in a booklet recently published by that company entitled “The Automobile Industry and Its Future.” This is a comprehensive discussion of this subject which should be of interest to every automotive manufacturer and dealer in the country, and is a truly valuable and somewhat remarkable contribution to the statistical history of the industry.

Several of the interesting tables with which Mr. Ayres illuminates his discourse are reproduced herewith, and furnish in themselves a copious supply of “food for thought” to the contemplative mind.

The first table shown gives the registration by thousands of motor cars in each state and in the geographic divisions each year from 1912 to 1920. This tabulation is the result of a careful attempt to construct a complete record of registration for each state since 1912. Where figures have been missing in the original records they have been supplied by using data based on those of neighboring states. Similar methods have been used where the data were based on three-year registrations, or perennial systems. The figures are given in round thousands because it is believed that greater detail would not increase their reliability. As the table stands it is believed to represent, somewhat more accurately than have previous compilations, the number of motor cars that would have been registered in each state each year if the system of registration had been complete and uniform since 1912. The data include both passenger and commercial cars, but not motorcycles, tractors or dealers' cars.

Data of Production.

The year 1895 may be taken somewhat arbitrarily as marking the beginning of the automobile industry on a commercial basis in America. It seems probable that the first electric vehicle for street use was sold by William Morrison of Des Moines, Ia., in 1892. The first sale of a gasoline-propelled car is stated to have been made by Alexander Winton of Cleveland, O., in 1898. During 1896, 1897 and 1898 at least 10 of the important pioneer companies began the sale of electric cars, while several makers of gasoline and steam cars began production in 1889 according to available data.

The first official data on car output are those of the census of manufacturers of 1899. By that date so great progress had been made that the census recorded 57 establishments, employing 2241 wage

earners, as making automobiles. Their output during the year was 3700 vehicles and, in addition, 174 more were made in factories primarily devoted to the manufacture of carriages and wagons. This

MOTOR CARS REGISTERED IN EACH STATE AND IN THE GEOGRAPHIC DIVISIONS EACH YEAR FROM 1912 TO 1920—FIGURES REPRESENT THOUSANDS.

| | 1912 | 1913 | 1914 | 1915 | 1916 | 1917 | 1918 | 1919 | 1920 |
|----------------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|
| Maine | 8 | 11 | 16 | 22 | 31 | 41 | 40 | 53 | 63 |
| New Hampshire | 6 | 7 | 10 | 13 | 18 | 22 | 25 | 32 | 35 |
| Vermont | 4 | 6 | 8 | 11 | 16 | 20 | 22 | 27 | 32 |
| Massachusetts | 50 | 63 | 77 | 103 | 137 | 174 | 193 | 247 | 305 |
| Rhode Island | 9 | 10 | 12 | 16 | 21 | 37 | 36 | 45 | 50 |
| Connecticut | 24 | 27 | 33 | 44 | 62 | 86 | 93 | 110 | 119 |
| New England | 101 | 124 | 156 | 209 | 285 | 380 | 409 | 514 | 604 |
| New York | 107 | 134 | 170 | 234 | 313 | 412 | 464 | 572 | 669 |
| New Jersey | 43 | 49 | 60 | 78 | 104 | 135 | 156 | 191 | 229 |
| Pennsylvania | 59 | 76 | 113 | 160 | 231 | 325 | 394 | 482 | 570 |
| Middle Atlantic | 209 | 259 | 343 | 472 | 653 | 872 | 1,014 | 1,245 | 1,467 |
| Ohio | 63 | 86 | 123 | 181 | 252 | 347 | 413 | 511 | 615 |
| Indiana | 34 | 47 | 66 | 97 | 139 | 192 | 227 | 277 | 333 |
| Illinois | 68 | 95 | 131 | 181 | 248 | 340 | 390 | 478 | 569 |
| Michigan | 40 | 54 | 76 | 115 | 160 | 247 | 262 | 326 | 413 |
| Wisconsin | 25 | 35 | 53 | 80 | 116 | 166 | 197 | 237 | 293 |
| East No. Central | 230 | 317 | 449 | 654 | 915 | 1,292 | 1,489 | 1,829 | 2,223 |
| Minnesota | 29 | 38 | 65 | 93 | 138 | 163 | 165 | 195 | 224 |
| Iowa | 47 | 75 | 112 | 152 | 199 | 254 | 278 | 364 | 437 |
| Missouri | 24 | 38 | 54 | 76 | 104 | 148 | 188 | 244 | 297 |
| North Dakota | 9 | 13 | 16 | 25 | 40 | 63 | 72 | 83 | 91 |
| South Dakota | 14 | 15 | 21 | 29 | 44 | 67 | 91 | 105 | 120 |
| Nebraska | 16 | 26 | 41 | 59 | 101 | 148 | 175 | 192 | 223 |
| Kansas | 22 | 34 | 49 | 73 | 112 | 159 | 189 | 228 | 265 |
| West No. Central | 161 | 239 | 361 | 507 | 738 | 1,002 | 1,158 | 1,411 | 1,657 |
| Delaware | 2 | 2 | 3 | 5 | 7 | 11 | 13 | 16 | 18 |
| Maryland | 10 | 14 | 20 | 31 | 44 | 61 | 75 | 96 | 112 |
| District of Columbia | 2 | 2 | 5 | 8 | 13 | 15 | 30 | 35 | 40 |
| Virginia | 6 | 9 | 14 | 21 | 35 | 55 | 72 | 94 | 134 |
| West Virginia | 5 | 5 | 6 | 13 | 21 | 31 | 39 | 50 | 79 |
| North Carolina | 6 | 10 | 15 | 21 | 34 | 56 | 72 | 109 | 141 |
| South Carolina | 10 | 12 | 15 | 15 | 19 | 40 | 55 | 70 | 98 |
| Georgia | 19 | 19 | 21 | 26 | 48 | 70 | 100 | 127 | 144 |
| Florida | 2 | 2 | 3 | 11 | 21 | 27 | 54 | 55 | 74 |
| So. Atlantic | 62 | 75 | 102 | 151 | 242 | 366 | 510 | 652 | 835 |
| Kentucky | 5 | 7 | 12 | 20 | 32 | 47 | 66 | 91 | 113 |
| Tennessee | 9 | 12 | 20 | 25 | 30 | 48 | 63 | 80 | 102 |
| Alabama | 3 | 5 | 8 | 12 | 22 | 33 | 46 | 59 | 75 |
| Mississippi | 3 | 3 | 6 | 10 | 25 | 37 | 48 | 55 | 63 |
| East So. Central | 20 | 27 | 46 | 67 | 100 | 165 | 223 | 285 | 353 |
| Arkansas | 2 | 3 | 6 | 8 | 15 | 29 | 41 | 49 | 59 |
| Louisiana | 7 | 7 | 12 | 11 | 17 | 28 | 40 | 51 | 66 |
| Oklahoma | 7 | 8 | 14 | 25 | 53 | 100 | 122 | 145 | 204 |
| Texas | 35 | 54 | 65 | 138 | 195 | 213 | 251 | 331 | 428 |
| West So. Central | 51 | 72 | 97 | 182 | 283 | 370 | 454 | 576 | 757 |
| Montana | 2 | 6 | 10 | 14 | 24 | 43 | 51 | 59 | 61 |
| Idaho | 2 | 2 | 3 | 7 | 13 | 25 | 32 | 42 | 51 |
| Wyoming | 1 | 2 | 2 | 4 | 7 | 13 | 16 | 21 | 24 |
| Colorado | 9 | 13 | 18 | 28 | 43 | 67 | 84 | 105 | 129 |
| New Mexico | 1 | 2 | 3 | 5 | 8 | 5 | 15 | 18 | 22 |
| Arizona | 2 | 3 | 5 | 7 | 12 | 20 | 24 | 29 | 35 |
| Utah | 3 | 4 | 7 | 9 | 14 | 24 | 32 | 35 | 43 |
| Nevada | 1 | 1 | 1 | 2 | 5 | 7 | 8 | 9 | 10 |
| Mountain | 21 | 33 | 49 | 76 | 126 | 207 | 262 | 318 | 376 |
| Washington | 14 | 24 | 30 | 39 | 61 | 91 | 117 | 149 | 174 |
| Oregon | 10 | 14 | 16 | 24 | 34 | 49 | 63 | 83 | 104 |
| California | 65 | 103 | 124 | 164 | 232 | 307 | 365 | 477 | 569 |
| Pacific | 89 | 141 | 170 | 227 | 327 | 447 | 545 | 709 | 847 |
| United States | 944 | 1,287 | 1,773 | 2,545 | 3,678 | 5,101 | 6,064 | 7,539 | 9,119 |

output of 3874 cars in 1899 undoubtedly consisted mostly of electric vehicles.

Fundamental Facts of Production.

The second table, shown herewith, attempts to give the essential fundamental data of the production and use of automobiles since the beginning of the industry in this country. Its production figures were taken from the reports of the census each five years, beginning with 1899, supplemented by data for the intervening years compiled by the National Automobile Chamber of Commerce. In addition, the War Industries board reported official figures for the years 1917 and 1918. The figures prior to 1899, and from that date on to the next official data in 1904, are estimates.

This table gives in its second column, the computed number of old cars carried over each year from the year previous. It gives, in the next two columns, the number of Ford cars and of other cars built each year. This distinction is made because it is of fundamental importance in a consideration of the past history and probable future of the industry. The fourth and fifth columns give the number of cars imported and exported each year. These data are taken mainly from the reports of the Bureau of Foreign and Domestic Commerce of the United States Department of Commerce and from the earlier summaries of commerce and finance that preceded them. The very earliest figures of the columns are partly estimated. The exports for 1918 have been increased to include the cars shipped abroad by the army.

since the inception of the industry 25 years ago. Up to the end of 1920 the total number of cars made in the United States since the beginning has been 11,775,163, according to these figures. Of this number 4,671,202 were Fords. The aggregate imports have been 13,296 and the exports 712,646.

After making allowance for imports and exports it is found that the total number of new cars put into use in this country since the beginning has been 11,075,813. Since the number registered last year was somewhat in excess of 9,000,000, and the number in use at the end of the year undoubtedly rather less than that amount, it follows that about 2,000,000 cars have been eliminated, and the report purposes to find how these eliminations have been distributed.

Computation of Registration.

The third column from the last gives the number of cars registered each year. These are figures of record beginning with 1912. Previous to that date they are computed by calling the registration of any one year equal to the number of cars put into use in that year and five previous years. This method, applied to the last nine years of the series for which we have actual data of record, gives closely accurate results and so its use for the earlier years seems justifiable. It gives figures showing how many cars would have been registered each year if the system of annual registration had been continuously in use, and they may be accepted as fairly reliable estimates.

production after corrections were made for exports and imports. Beginning in 1911 the data for elimination are based on the recorded figures for production and registration. In general the figures for cars discarded show a tendency to be high in years of prosperity and low in years of business depression.

The most dependable method of computing the average life or duration of service of automobiles seems to be that which compares the registration of any year with the figures for the production of that and previous years. The outstanding fact about the registration figures is that they have been for the past nine years about equal each year to the sum of the cars produced in that year and the five previous years. This means that the average length of life of the cars has been about six registrations. This is substantiated by the report of the postmaster-general for 1916 that the depreciation of cars in the postal service has been at the average rate of 22.9 per cent. per year. The annual reports of the Interstate Commerce commission show substantially the same depreciation. These cars, of course, receive exceptionally hard usage. It is somewhat surprising to note, however, that the average length of service of cars appears to have stayed nearly constant toward the end of the period covered instead of growing longer as cars and roads have been improved. It seems not improbable that this is due not to any decline in the quality of the cars, but from the fact that in recent years the great increase in the output and registration of automobiles has been largely caused by the enormous production of light and inexpensive cars and that a major part of them have gone into farming communities where they have been subjected to the hardest sort of use over the worst kinds of roads.

The accompanying table of prices shows the figures, year by year, of 25 standard makes of touring cars from 1913 to the present time. Of these cars five are four-cylinder machines which are widely used, while the other 20 are well-known six-cylinder machines. The attempt has been made in each case to get the typical price for each year on the same model over the entire period as nearly as this is possible in view of the great improvements that have been made.

The figures at the bottom of the table show the average and median prices of the 25 cars over these eight years. The median is a kind of average that is found by taking each year the middle price among the 25 prices in the column. The median price is such a price each year that there are 12 among the 25 cars that are cheaper, and 12 that are more expensive.

The course of the average and median figures show that the typical prices of cars fell from 1913 to 1916 and rose from that point to the beginning of 1921, when they again began to decline.

During the period of increasing competition from 1913 to 1916 the prices of medium-grade cars fell most severely, and during the long period of expanding

(Continued on Page 39.)

PRODUCTION AND USE OF AUTOMOBILES IN THE UNITED STATES SINCE THE BEGINNING OF THE INDUSTRY.

| Year | Cars carried over from last year | Ford cars made | Other cars made | Cars imported | Cars exported | Total new cars added during year | Cars registered during year | Cars eliminated during year | Cars in use at end of the year |
|--------|----------------------------------|----------------|-----------------|---------------|---------------|----------------------------------|-----------------------------|-----------------------------|--------------------------------|
| 1895.. | ..... | ..... | 300 | ..... | ..... | 300 | 300 | ..... | 300 |
| 1896.. | 300 | ..... | 600 | ..... | ..... | 600 | 900 | ..... | 900 |
| 1897.. | 900 | ..... | 1,200 | ..... | ..... | 1,200 | 2,100 | ..... | 2,100 |
| 1898.. | 2,100 | ..... | 2,400 | 100 | ..... | 2,500 | 4,600 | ..... | 4,600 |
| 1899.. | 4,600 | ..... | 3,874 | 150 | ..... | 4,024 | 8,624 | ..... | 8,624 |
| 1900.. | 8,624 | ..... | 5,000 | 200 | ..... | 5,200 | 13,824 | 300 | 13,524 |
| 1901.. | 13,524 | ..... | 7,000 | 250 | 184 | 7,066 | 20,590 | 600 | 19,990 |
| 1902.. | 19,990 | ..... | 9,000 | 300 | 535 | 8,765 | 28,755 | 1,200 | 27,555 |
| 1903.. | 27,555 | 708 | 10,292 | 350 | 822 | 10,528 | 38,083 | 2,500 | 35,583 |
| 1904.. | 35,583 | 1,000 | 21,830 | 400 | 949 | 22,281 | 57,864 | 4,024 | 53,840 |
| 1905.. | 53,840 | 1,695 | 23,305 | 496 | 1,348 | 24,148 | 77,988 | 5,200 | 72,788 |
| 1906.. | 72,788 | 1,599 | 32,401 | 1,295 | 1,155 | 34,140 | 106,928 | 7,066 | 99,862 |
| 1907.. | 99,862 | 8,423 | 35,577 | 1,093 | 2,894 | 42,199 | 142,061 | 8,765 | 133,296 |
| 1908.. | 133,296 | 6,398 | 58,602 | 1,347 | 2,164 | 64,183 | 197,479 | 10,528 | 186,951 |
| 1909.. | 186,951 | 10,607 | 116,680 | 1,645 | 4,686 | 124,246 | 311,197 | 22,281 | 288,916 |
| 1910.. | 288,916 | 18,664 | 165,336 | 1,024 | 8,443 | 179,581 | 468,497 | 24,148 | 444,349 |
| 1911.. | 444,349 | 34,528 | 175,472 | 972 | 15,807 | 195,165 | 639,514 | 50,662 | 588,852 |
| 1912.. | 588,852 | 78,440 | 299,560 | 868 | 23,720 | 355,148 | 944,000 | 115,603 | 828,397 |
| 1913.. | 828,397 | 168,220 | 316,780 | 492 | 26,889 | 458,603 | 1,287,000 | 61,570 | 1,225,430 |
| 1914.. | 1,225,430 | 248,307 | 324,732 | 296 | 25,765 | 547,570 | 1,773,000 | 56,881 | 1,716,119 |
| 1915.. | 1,716,119 | 308,213 | 584,405 | 221 | 63,958 | 528,881 | 2,545,000 | 371,196 | 2,173,804 |
| 1916.. | 2,173,804 | 523,929 | 1,059,688 | 1,429 | 80,850 | 1,504,196 | 3,678,000 | 365,790 | 3,312,210 |
| 1917.. | 3,312,210 | 735,266 | 1,138,691 | 78 | 80,235 | 1,788,790 | 5,101,000 | 81,218 | 5,019,781 |
| 1918.. | 5,019,781 | 706,554 | 1,447,053 | 73 | 109,491 | 1,044,219 | 6,064,000 | 319,009 | 5,744,991 |
| 1919.. | 5,744,991 | 790,954 | 1,085,402 | 117 | 82,464 | 1,794,009 | 7,539,000 | 446,010 | 7,092,990 |
| 1920.. | 7,092,990 | 1,027,677 | 1,177,520 | 100 | 180,287 | 2,025,010 | 9,118,000 | ..... | ..... |

New Cars Added Each Year.

The sixth column gives the total number of new cars added each year. These figures are the result of adding the new Fords and the other cars manufactured and the cars imported, and then subtracting from this total the cars exported. The results probably give with fairly close accuracy the total number of cars that have been put to use in this country

Data of Elimination.

In the next to the last column are figures showing the number of cars eliminated each year. It will be noted that the numbers previous to 1911 are in each case equal to the figures for new cars added five years earlier. This is because the registration figures for this early period are not data of record, but are computed as being equal to six years of



Rural Districts Are Well Served by This Unique Motor Library Which Authorities Claim Eventually Will Become a Big American Institution.

"Parnassus on Wheels"

NOT so many years ago you heard the argument that the automobile was destined to monopolize people's time, that they would have no more leisure hours for reading and that the nation would consequently degenerate below its present standard of culture.

Since then, of course, it has been proved pretty definitely that exactly the reverse is true. The automobile saves such an enormous amount of time that people have more opportunity than ever to read. There is no danger that the motor car and culture will ever conflict.

As a matter of fact, there are a number of librarians in the country today who will tell you that the automobile is helping them introduce traces of culture into communities that would otherwise fall to develop an appetite for books for years to come. These librarians are taking their books to the farms—by automobile. They are introducing the motorized library, and the success which has attended their efforts indicates that it is one of the certain American institutions of the future.

Particular success with the motorized library is found in the case of Noblesville, Ind., a city of about 5000, situated about 20 miles north of Indianapolis. In an exceedingly interesting article describing the methods and results employed in delivering the library to the farmer's door, Miss Lula M. Miesse, Noblesville's librarian, says:

"We tried both adult and juvenile stations in schoolhouses and homes and found the adult section was not well patronized. The country schools are open only five days a week and only six months a year. So the house to house plan of service was determined upon. We visited some other cities, where library autos were in use, and after looking over various chassis and trucks, we decided upon a Dodge Brothers business car. In the first place it did not need a great deal of remodelling for our purpose. It was strongly built and highly recommended by people who were using it, for durability under hard service, which we knew

our car must receive.

"The seats were already comfortable. We had the wire screens and the entire back removed. The steel sides were bent over seven inches and used for shelves in front of the book cases. Inside the car we built our book cases of oak, with glass doors opening outward on both sides of the truck, so that it advertises its own wares as it travels over the country. The

CHINESE MOTOR LAWS.

NEW motor laws which have been recently put into effect in China provide that "a car shall have a very small bell attached to one of the front wheels, and this bell shall be kept ringing all the time so that when pedestrians hear it they may get out of the way. This bell should be half the size of a bicycle bell. All motor trucks shall have rails or iron chains around the cars to insure safety and in case of collision cargo will be prevented from falling and injuring pedestrians. There shall be one licensed chauffeur and an assistant to take charge of each motor car or truck. The assistant should sit behind and keep a look-out when the car turns around, goes backward, enters or leaves the garage. After a person is killed by a motor car a wax image of the deceased shall be made and placed in a room and any chauffeur who causes injury to other should be locked up in this room so that he will see the image and feel sorry. This may cause him to repent."

shelves slant slightly back to hold the books away from the glass.

"Our territory is now laid in 16 runs, but we must add at least five to these in order to cover it. Some of our trips are long. Number one, for instance, is 42 miles long and begins and ends 10 miles from Noblesville. We have driven our car through fresh gravel, mud and over ice. As we travel four days a week we cannot wait for good roads. The work is very interesting and grows more so as the librarians and the people get better acquainted. The demand for books has been so great that it has been almost impossible to satisfy both the city and the country, as we were not expecting and not well enough prepared for the voracious appetite for reading matter which we created.

"Our library car is called 'Parnassus' after Christopher Morley's book, 'Parnassus on Wheels.' It is a very interesting little book, about book peddling. We use an old-fashioned dinner bell to call our patrons, this being more effective than the horn. One side of the car is used for adult and the other for children's books. We carry about 300 books on the shelves and extra fiction and juvenile books inside. Fiction is in greatest demand, but we also circulate books on farming, travel, history, literature, music and Bible literature. We carry fairy stories and bear stories for the younger children and have introduced many youthful readers to Little Women, Tom Sawyer and Pinocchio. One great advantage of our system to the rural patrons is that there are no fines attached to books charged to the library auto cards.

"The people in the country think we made a good choice of a car, as it is a good car, but not the most expensive. They make many comments on the car, especially since we have met the men in the homes.

"The Indiana Library commission is trying to push the country library idea as are many other states. It is much better to have a strong central library, where decent salaries are paid, than so many small libraries, barely alive, and of not much use in the community. The Indiana librarians are very much interested in our work.

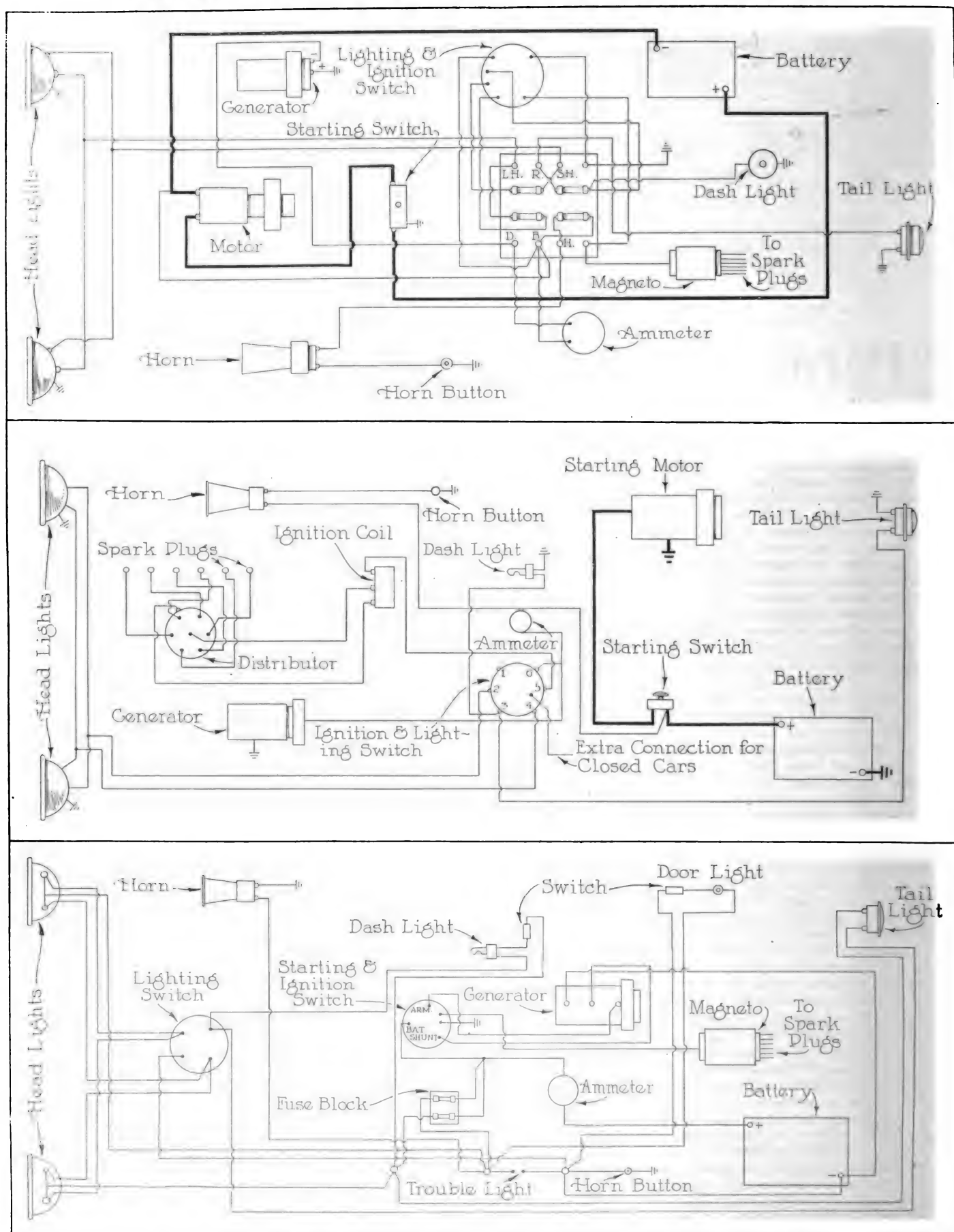
"Our car now regularly visits almost 800 homes and has about 1500 patrons, the circulation running from 100 to 150 per run. We will give more service when the remainder of our territory is organized. It is the most interesting library work we have ever done and we hope all of Indiana may have similar service in the near future."

HERE'S NOVEL IDEA.

The latest in gasoline vending is seen in the plan worked out by an Ohio filling station man whereby a guessing wheel is installed adjacent to the pump. You call your number, round goes the wheel and if you guess right the gasoline is yours, and nothing to pay.

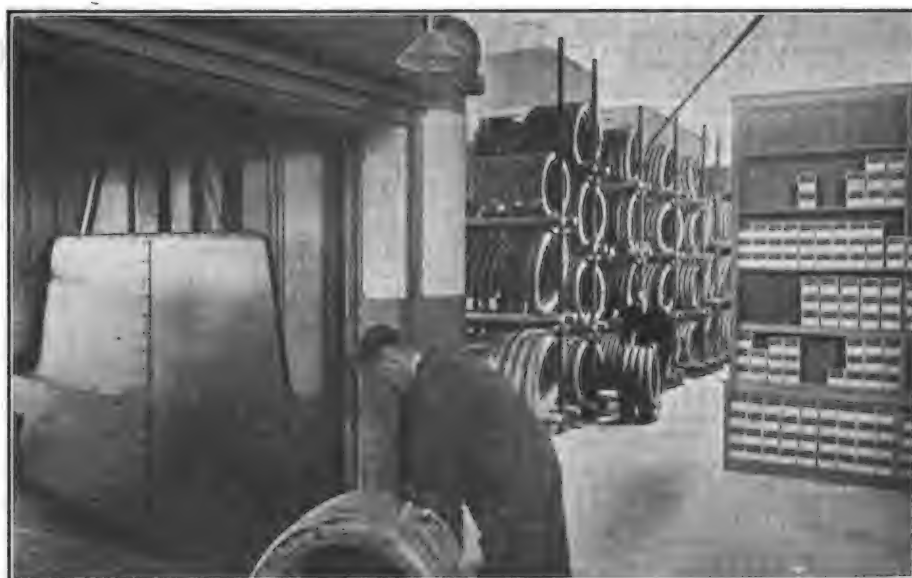
This method of merchandising may work all right as a novelty, but it won't have the general approval of the trade. It savors rather too much of gambling.

Monthly Wiring Diagram, No. 23



Top: Jordan 1917-18-19 Model C-60 Bijur Two-Unit System, Single-Wire Lighting, Double-Wire Starting Circuits, High-Tension Magneto Ignition. Center: Jordan 1920 Model F-M Belco Two-Unit, Single-Wire Starting and Lighting System. Bottom: Holmes 1920-21 Dyneto System Two-Wire Circuits, High-Tension Magneto Ignition.

Careful Attention
to Detail Is
the Secret of
Modern Efficiency.
This Fact Is
Well Known by
the Management
of the Firestone



Branch at
Los Angeles,
As Is Shown
by the Excellent
Stock Arrange-
ments and the
Large, Roomy
Elevator.

TIRE PRICES LOWER.

THE revised price schedules put into effect during the past month by the major rubber companies have brought rates down to a level ranging from 10 to 15 per cent. below pre-war figures. Two significant features are disclosed upon an examination of the reductions: One is that the smaller sized tires, which are in the greatest demand, since they fit the cars which are turned out in the greatest quantities, are placed on a scale that is highly competitive and is expected to be productive of business. The second is that the new lists cut down the margin of difference between fabric and cord tires, making it possible for the latter to be bought within 25 to 30 per cent. as cheaply as fabrics. Thus in most cases cord tires were reduced approximately 20 per cent., while fabrics were cut only 10 per cent. This not only creates a difference by percentages, but also lessens the contrast.

Another factor which enters into the present situation is that the present tire reductions may be divided into two stages, allowances made to the dealer and lower figures to the consumer.

Following are the late reductions announced by representative tire manufacturers of the country:

American Tire Corporation, Niles, O.: Cords, 15 to 32 per cent.; fabrics, 14 to 18 per cent.; tubes, 12 to 18 per cent.

Firestone: Cords, 20 per cent.; fabrics, truck pneumatics and truck solids, 8 1/3 to 16 2/3 per cent.

Fisk: Tires and tubes, 10 to 33 1/3 per cent.

General: Cords, 32x4, 33 1/3 per cent.; fabrics, 30x3 1/2, 21 1/2 per cent.; tubes, 30x3 1/2, 14 per cent.

Goodrich: Cords, 30x3 1/2, 26 1/3 per cent.; 32x3 1/2, 22 per cent.; 31x4, 28 per cent.; 32x4, 25 per cent.; 37x5, 11 1/2 per cent.; 35x5, 11 2/3 per cent.; fabrics, 30x3 1/2, 14 per cent.; tubes, 30x3 1/2, 11 2/3 per cent.

Goodyear: Cords, 3 1/2 and 4-inch straight side, 30 per cent.; 3 1/2-inch clincher, 25 per cent.; 4 1/2 and 5-inch straight side, 20 per cent.; fabrics, 10 to 20 per cent.; diamond tread solid trucks,

Tires

15 per cent. average; pneumatic trucks, 10 per cent.; smooth solid trucks, 6 per cent.; cushion trucks, 10 per cent.; pneumatic truck tubes, 10 and 15 per cent.; automobile tubes, 30x3 1/2, 11 2/3 per cent.

Kelly-Springfield: Cords, 20 per cent.; fabrics, 10 per cent.; caterpillar trucks, 15 per cent.; standard trucks, 10 per cent.; tubes, 10 to 20 per cent.

Kenyon: Cord tires and tubes, 8 to 10 per cent.

Keystone: Cuts to bring prices down to Goodyear.

Lee: Cords and tubes, 22 per cent.; fabrics, 30x3 1/2, 5 per cent.

McGraw: Cords, 12 to 28 per cent.; fabrics, 6 to 14 per cent.

Madison: Cords, 32x4, 20 1/2 per cent.; fabrics, 30x3 1/2, 12 per cent.; tubes, 30x3 1/2, 6 per cent.

Michelin: Cords, oversize up to 4 1/2-inch, 10 per cent.; regular cords, 6 to 12 per cent.; fabrics, 2 to 7 per cent.; tubes, 30x3 1/2, 5 per cent.

Miller: Cords, 20 to 30 per cent.; fabrics, 10 to 20 per cent.; trucks, 10 to 20 per cent.; tubes, 30x3 1/2, 12 per cent.

Mohawk: Cords, 17 to 24 per cent.; fabrics, 10 to 20 per cent.; tubes, 13 per cent.

Pennsylvania: On all sizes except Fords, 15 per cent.; tubes, 30x3 1/2, 9 1/2 per cent.

Republic: Cuts to bring prices on pneumatics down to other manufacturers.

Revere: Cords, 32x4, 29 per cent.; fabrics, 30x3 1/2, 22 per cent.; tubes, 30x3 1/2, 12 per cent.

Syra-Cord: Cords and fabrics, 30x3 1/2, special five-ply, 20 per cent.; fabrics, regular, cord trucks and cord tubes, 10 per cent.

United States: Cords, 32x4, 27 1/2 per cent.; fabrics, 30x3 1/2, 30 per cent.; tubes, 30x3 1/2, 12 per cent.

Victor: Cords, 30 per cent.; fabrics, 22 per cent.; tubes, 3 to 10 per cent.

ABOUT TIRE CHAINS.

DURING winter months the motorist is called upon to attach tire chains to or to remove them from his tires, their use depending upon the condition of the streets, whether slippery or not. Ice, snow and slush are the three elements which make chains needed, as it is much harder to obtain traction at these times than others. Now that nearly all cars and light weight trucks are equipped with non-skid tires, the use of chains at ordinary times is not as necessary, as the non-skid treads of the tires will usually prevent slipping badly unless the tread is worn down so that the knobs no longer get a firm hold. It is not necessary that the wheel should be jacked in order to place a chain on the tire as a better method, especially in soft mud or snow where the jack would sink in, is to lay the chain on the ground in front of the wheel to which it is to be applied with the hooks placed farthest from the wheel. Roll the wheel on to the chain either with the power of the engine or by hand and pull the ends of the chain up on to the tire, running the hand around the free part of the tire to take up the slack so that the hooks may be made fast to the links. A chain should not be attached too tight, neither should it be too loose, as one extreme is nearly as bad as the other. A chain that is attached so tight that the cross links cannot work on the tread, will eventually cut the rubber of the tread, causing tire deterioration, while a chain that is adjusted too loose will strike the fenders with the cross chains when the car or truck is heavily loaded. The use of chain tighteners is not recommended by the chain manufacturers, as it prevents creeping of the cross chains, which is necessary for good chain action. In removing the chains the same method can be followed as when attaching: rolling the tire into position so that the hooks come at the top, using a sharp pointed awl or small screw driver to open the hooks. Dropping the ends to the ground allows the wheel to be rolled off of the chain.

Meets With Operators Approval

Apollo Magneto Designed for Four-Cylinder Engines but Easily Adapted for Use with Two or Six-Cylinder Type—Is Called Efficient Unit.

THE executive personnel of the Apollo Magneto Corporation, located at Kingston, N. Y., has been for years engaged in the manufacture of high-grade and intricate machine parts. The engineers and heads of the manufacturing departments have been actively connected with the magneto business both in this country and abroad for a period of over 15 years. Their broad experience in the magneto field has enabled them to design an instrument which, it is claimed, has proved superior in many respects.

The present factory was built and equipped during the latter part of 1919, in accordance with the latest factory developments, and equipped with the most modern machinery obtainable for magneto production.

This company is an outgrowth of the Magneto Winding Co., which was originally organized in 1918.

THE Apollo magneto is of the high-tension type, constructed along conventional lines to meet the demand for a thoroughly built, high-class instrument. Careful design and good materials have been combined with expert workmanship to produce an efficient device which is simple and compact.



The Apollo Magneto Is a Compact, Water-Proof High-Grade Unit of Electrical Energy.

The Apollo magneto is primarily designed for use with four-cylinder engines and for rotation in either direction. It may, however, be easily adapted for use with two or six-cylinder engines by a simple alteration of the interrupter, requiring no additional parts, which makes the change from clockwise to counter-clockwise or vice versa. Two additional parts fit the four-cylinder magneto for use with a two-cylinder engine, while seven additional parts are required to adapt it for service with a six-cylinder engine.

Construction of the Housing.

The housing is a one-piece aluminum die casting while the pole pieces are laminated and cast integrally with the housing. This allows them to be made of special sheet iron with a greater magnetic permeability than otherwise and permits a better distribution of the flux. By this method, retaining screws and pins are eliminated, reducing the reluctance in the poles. All internal machine operations are performed at one setting with a built-up tool, and the accuracy obtained allows a minimum air gap between the poles and the armature, thereby increasing the efficiency of the magneto. Brass inserts are used wherever necessary in building up the die castings.

The magnets are of the U-type, made of the highest grade tungsten permanent magnet steel and by manufacturers who have been for years specialists in the manufacture of permanent magnets.

The Apollo armature is wound on a laminated core, using enamelled magnet wire to form the coils. This method allows a closer winding, increasing the efficiency of the magneto. The armature assembly includes the core, winding, plates and condenser.

The condenser, which is located in the base, is fastened by one bolt which passes through and grounding it, thus forming a positive ground connection and avoiding a common source of trouble from a loose condenser connection which is hard to get at. In addition, there is another bolt which passes entirely through the condenser, which is insulated and used to securely anchor the condenser in the housing. The condenser is so proportioned in size as to permit a slight sparking at the points, sufficient to keep them in good condition without burning.

The slip ring is composed of hard rubber in which is cast a brass contact ring. It is made exceptionally thick through the center section with a recess at either side of the contact face, making it practically impossible for the spark to jump across and damage the ring.

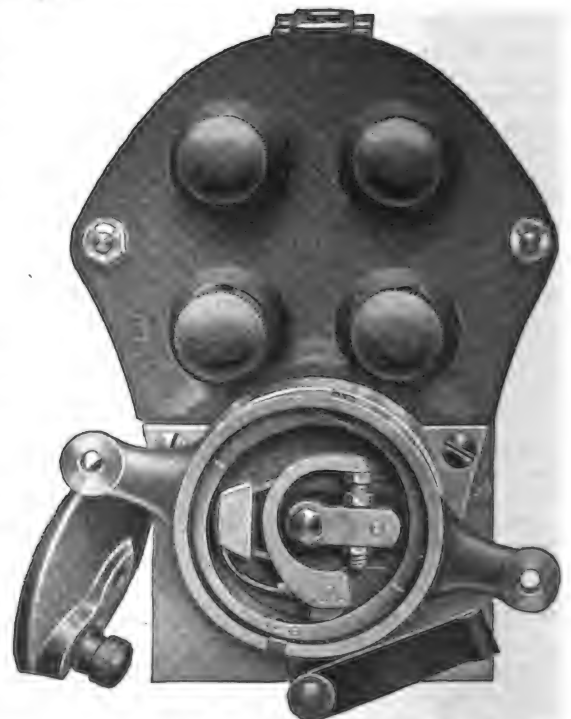
The end thrust of the armature is not in any way taken by the slip ring as a shoulder is provided on the cam end plate for this purpose. One side of the cam end plate shaft is made flat at the point where the slip ring is retained, for the purpose of giving extra thickness to the slip ring at the point where the high-tension connection is made.

The safety spark gap is obtained by the proximity of a rib on the triangular end plate to the slip ring contact. As it is thus an integral part of the magneto, all chance of damage through its omission or alteration is obviated. The gap is set at $\frac{3}{8}$ of an inch.

Distributor Is of Hard Rubber.

The distributor is made of moulded hard rubber compound, while all brushes are of the same size and the large gear is made of micarta and is noiseless and durable.

The interrupter of the Apollo magneto contributes largely to its sustained hot spark. The points open in parallel relation to each other, thus assuring permanently an even contact surface with no excess sparking. The interrupter cam, which is of steel, hardened and ground, is so designed as to allow the necessary rapid opening of the points, and permits them to close more gradually than is customary, thus eliminating the hammering effect. Its lubrication is accomplished by the overflow from the end bearing lubrication. The statement is made that the elimination of the hammering on the points and of excessive sparking, and the further fact that the cam contact is lubricated enables them to run longer.



Apollo Breaker Points Accessible for Cleaning, Adjusting and Fitting New Points.

Calendar of Conventions and Exhibitions

Jan. 4-6—Omaha, Neb., Convention and Exhibition, Mid-West Implement Dealers' Association; Secretary, James Wallace, Council Bluffs, Ia.

Jan. 7-13—New York City, National Automobile Show, National Automobile Chamber of Commerce, Madison Square Garden.

Jan. 9-14—New York City, First National Automobile Body Builders' Show, Automobile Body Builders' Association, 12th Regiment Armory; Passenger and Commercial Bodies, Materials and Parts.

Jan. 9-20—New York City, First Annual Retail Dealers' Auto Equipment Show, Hotel Imperial, National Retail Merchants' & Buyers' Association; Accessories and Automobile Clothing; George T. Keen, Secretary, Hotel Imperial.

Jan. 10-12—Minneapolis, Minn., Convention, Minnesota Implement Dealers' Association; Secretary, C. I. Buxton, Owatonna, Minn.

Jan. 11-14—New York City, Annual Meeting, Society of Automotive Engineers, Jan. 13—Newton, Mass., New England Sectional Meeting, Society of Automotive Engineers, Plant of Stanley Automobile Co.

Jan. 14-20—Cleveland, O., Automobile Show, Cleveland Automobile Manufacturers' & Dealers' Association.

Jan. 14-20—Buffalo, N. Y., Automobile Show, Buffalo Automobile Dealers' Association.

Jan. 14-21—Philadelphia, Pa., Automobile Show, Philadelphia Automobile Trade Association, Commercial Museum; Executive Secretary, Charles C. Bulkeley.

Jan. 16-21—Rochester, N. Y., 14th Annual Automobile Show, Rochester Automobile Dealers' Association, Exposition Park Building; Manager, E. M. Alling.

Jan. 16-21—Tulsa, Okla., Automobile Show.

Jan. 16-22—Oakland, Cal., Motor Car Show, Alameda County Automobile Trade Association, Auditorium; Manager, Robert W. Martland.

Jan. 17—Buffalo, N. Y., Sectional Meeting, Society of Automotive Engineers.

Jan. 17—Dayton, O., Sectional Meeting, Society of Automotive Engineers; "Lubrication."

Jan. 17-19—Kansas City, Mo., Convention, Western Retail Implement, Vehicle & Hardware Association; Headquarters, Coates House; Sessions in Century Theater; H. J. Hodge, Secretary, Abilene, Kan.

Jan. 17-20—Spokane, Wash., Convention, Pacific Northwest Hardware & Implement Association, Davenport Hotel; E. E. Lucas, Secretary, Hutton Building, Spokane.

Jan. 17-20—Chicago, Ill., Convention, American Road Builders' Association.

Jan. 19-25—Milwaukee, Wis., Annual Automobile Show, Milwaukee Automotive Dealers' Association, Auditorium; Passenger Cars, Trucks and Accessories; Bart J. Ruddle, Manager, 316 Brumler Building.

Jan. 21-27—San Francisco, Cal., Third Annual Pacific Coast Automotive Equipment Exposition, Civic Auditorium, Pacific Expositions Co.

Jan. 21-23—Baltimore, Md., Annual Automobile Show, Fifth Regiment Armory, Baltimore Automobile Trade Association, Inc.; Manager, John E. Raine.

Jan. 21-23—Cleveland, O., Show, Cleveland Automobile Manufacturers' & Dealers' Association, Wigmore Coliseum; Manager, Fred H. Caley.

Jan. 23—Milwaukee, Wis., Annual Meeting, Wisconsin Automotive Dealers' Association.

Jan. 23—Montgomery, Ala., Annual Meeting, Alabama Automobile Dealers' Association; James B. Farley, Secretary, Montgomery.

Jan. 23-26—Toledo, O., Automobile Show, Terminal Auditorium, Toledo Automobile Shows Co.; Manager, H. V. Bue-low.

Jan. 23-26—Portland, Ore., Annual Automobile Show.

Jan. 24—Detroit, Mich., Sectional Meeting, Society of Automotive Engineers.

Jan. 24-26—St. Louis, Mo., Convention, Mississippi Valley Implement & Hardware Association; Secretary, F. E. Goodwin, Kirkwood, Mo.

Jan. 24-26—Dallas, Tex., Convention, Texas Hardware & Implement Association; Secretary, A. M. Cox, Dallas.

Jan. 24-26—Denver, Col., Convention, Mountain States Hardware & Implement Association; Secretary, W. W. McAllister.

Jan. 24-27—Louisville, Ky., Convention and Exhibition, Kentucky Hardware & Implement Dealers' Association; Secretary, J. M. Stone, Sturgis, Ky.

Jan. 24-27—Portland, Ore., Convention, Oregon Retail Hardware & Implement Dealers' Association, Imperial Hotel; E. E. Lucas, Secretary, Hutton Building, Spokane, Wash.

Jan. 25-27—Fargo, N. D., Convention and Exhibition, North Dakota Implement Dealers' Association; Secretary, R. A. Lathrop, Hope, N. D.

Jan. 26—Philadelphia, Pa., Sectional Meeting, Society of Automotive Engineers.

Jan. 26—Worcester, Mass., Passenger Car Show, Worcester Automotive Association, Casino.

Jan. 28-Feb. 3—Chicago, Ill., Automobile Salon.

Jan. 28-Feb. 3—Chicago, Ill., National Automobile Show, National Automobile Chamber of Commerce, Coliseum.

Jan. 28-Feb. 4—Allentown, Pa., Automobile Show, Association Building, Lehigh Automobile Trade Association.

Jan. 30-31—Chicago, Ill., Fifth Annual Convention, National Automobile Dealers' Association, La Salle Hotel.

Jan. 30-Feb. 2—Boston, Mass., Sixth Annual Conference, International Delivery Association, Copley Plaza Hotel.

Jan. 30-Feb. 4—Scranton, Pa., Annual Automobile Show, Scranton Motor Trades Association, Armory; Manager, Hugh B. Andrews.

Jan. 30-Feb. 4—London, Ontario, National Motor Show of Western Ontario, Ontario Automotive Retailers' Association.

Jan. 30-Feb. 4—Scranton, Pa., 12th Annual Passenger Car Show, Scranton Motor Trades Association, Armory; Passenger Cars, Trucks, Tractors and Accessories. Hugh B. Andrews, Manager, 411 Board of Trade Building.

Jan. 31-Feb. 2—Chicago, Ill., Annual Meeting, Automotive Electric Service Association, La Salle Hotel.

Jan. 31-Feb. 2—Lincoln, Neb., Convention, Nebraska Retail Hardware Association; George H. Dietz, Secretary, 411-417 Little Building, Lincoln.

Feb. 1—Chicago, Ill., Meeting, Society of Automotive Engineers.

Feb. 1-4—Pontiac, Mich., Automobile Show, Pontiac, Automobile Dealers' Association.

Feb. 3—Chicago, Ill., Mid-West Meeting, Society of Automotive Engineers; "The Constitution of Matter," Professor H. B. Lemon.

Feb. 3-10—Minneapolis, Minn., 15th Annual Automobile Show, Minneapolis Auto Trade Association; Passenger Cars, Trucks and Accessories; W. R. Willmot, Manager, 709 Andrus Building, Minneapolis.

Feb. 4-11—Troy, N. Y., Eighth Annual Automobile Show, Troy Used Car Sales Corporation, Armory; Manager, Frank M. Baucus.

Feb. 4-11—Youngstown, O., Automobile Show, Youngstown Automobile Dealers' Association; Secretary, D. C. Barnett.

Feb. 4-11—Minneapolis, Minn., Automobile Show, Minneapolis Automobile Trade Association; Manager, Walter R. Willmot.

Feb. 6-9—Scranton, Pa., Annual Truck Show, Scranton Motor Trades Association, Armory; Hugh B. Andrews, Manager, 411 Board of Trade Building.

Feb. 6-11—Schenectady, N. Y., Automobile Show, Schenectady Automotive Dealers' Association, Inc., Armory; Manager, John Henley.

Feb. 6-11—London, Ont., Can., National Motor Show of Western Ontario, Auto-

motive Dealers' Association; Manager, T. C. Kirby.

Feb. 6-11—Winnipeg, Manitoba, Canada, Second Annual Automotive Equipment Association, Board of Trade Auditorium. Secretary, W. L. Williams, New Stovel Building, Winnipeg.

Feb. 6-11—Minneapolis, Minn., Seventh Annual National Tractor Show and Educational Exposition, National Implement & Vehicle Association, Minneapolis State Fair Grounds.

Feb. 7-10—Oklahoma City, Okla., Convention and Exhibition, Oklahoma Implement & Hardware Association; Secretary, W. B. Porch, Oklahoma City.

Feb. 7-10—Grand Rapids, Mich., Convention and Exhibition, Michigan Retail Hardware Association; Karl S. Judson, Exhibits Manager, 248 Morris Avenue, Grand Rapids; A. J. Scott, Secretary, Marine City, Mich.

Feb. 8—Minneapolis, Minn., Tractor Meeting, Society of Automotive Engineers.

Feb. 8-10—Minot, N. D., Convention, North Dakota Retail Hardware Association; Secretary, C. N. Barnes, Grand Forks, N. D.

Feb. 8-10—Milwaukee, Wis., Convention and Exhibition, Wisconsin Retail Hardware Association; P. J. Jacobs, Secretary, Stevens Point, Wis.

Feb. 8-11—Flint, Mich., Automobile Show, Flint Automobile Dealers' Association.

Feb. 9-16—Kansas City, Mo., Kansas City Motor Car Dealers' Association.

Feb. 11-18—Kansas City, Mo., Automobile Show, Kansas City Motor Car Dealers' Association, Overland Building; Manager, E. E. Peake.

Feb. 11-18—Atlanta, Ga., Second Annual Great Southern Automobile Show, Passenger Cars, Trucks and Accessories, Atlanta Automobile Association, Auditorium Armory; Show Manager, Virgil W. Shepard, 305 Connolly Building.

Feb. 11-18—San Francisco, Cal., Sixth Pacific Automobile Show, Motor Car Dealers' Association of San Francisco, Exposition Auditorium; Passenger Cars, Trucks, Tractors and Accessories; G. A. Wahlgreen, Manager, 215 Humboldt Bank Building.

Feb. 12—Madison, Wis., Ninth Annual Show, Automobile Dealer Division, Association of Commerce; Passenger Cars, Trucks and Accessories; Don W. Mowry, Manager, Cartwell Building.

Feb. 14-16—Chicago, Ill., Convention, Illinois Retail Hardware Association, Hotel Sherman; Leon D. Nish, Secretary, Elgin, Ill.

Feb. 14-17—Philadelphia, Pa., 21st Annual Exhibit and Convention, Pennsylvania & Atlantic Seaboard Hardware Association, Inc., Commercial Museum; Automobile Accessories, Etc.; Sharon E. Jones, Secretary, 1214 Fulton Building, Pittsburgh.

Feb. 14-17—St. Paul, Minn., Convention, Minnesota Retail Hardware Association; H. O. Roberts, Secretary, 1030 Metropolitan Life Building, Minneapolis.

Feb. 14-18—Kalamazoo, Mich., Automobile Show, Kalamazoo Automobile Dealers' Association.

Feb. 17-23—Trenton, N. J., Automobile Show, Trenton Automobile Trade Association, Second Infantry Armory; Manager, Frederick Petry, Jr.

Feb. 18-25—Hartford, Conn., Automobile Show, Hartford Automobile Dealers' Association, State Armory; Manager, Arthur Fifoot.

Feb. 18-25—Albany, N. Y., Automobile Show, Automobile Dealers' Association, State Armory.

Feb. 20-26—Bethlehem, Pa., Automobile and Accessory Show, Bethlehem Trade Association; Manager, J. L. Elliott.

Feb. 20-26—Grand Rapids, Mich., Automobile Show, Passenger Car Dealers' Association, Furniture Exhibition Building; Manager, M. D. Elgin.

(Continued on Page 42.)

ACCESSORIES DEPARTMENT

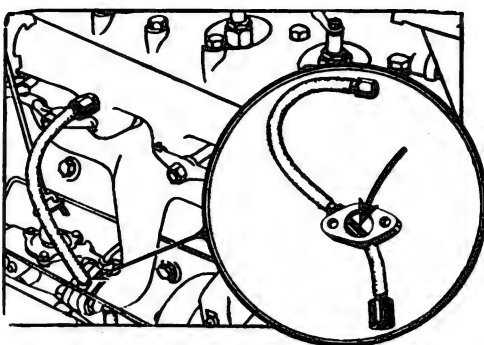
The **Scoe Hot Spot** is a low-priced vaporizer, designed for easy application without special facilities. The only tools required are a 5/16-inch drill and a standard 1/4-inch pipe tap, the same size used for grease cups and priming cups. The vaporizer itself is made in the form of a flange, which is inserted between the carburetor and the intake manifold, longer carburetor bolts being furnished. On the one side of the flange a thin copper tube, 1/4 of an inch in diameter, runs through the passage. This tube is constantly heated by the exhaust gas passing through, and is hot enough to be an efficient vaporizing surface. At all moderate speeds the position of the carburetor throttle valve is such that the mixture is directed against this hot tube while it is still in the form of a spray. It requires far less heat to convert spray into vapor than to vaporize the liquid gasoline after it has collected on the inside of the manifold. Tests made by the manufacturers show that the heat provided at this point will vaporize the gasoline effectively without loss of volumetric efficiency.

The exhaust gas is conducted from the manifold through a copper tube heavily insulated with woven asbestos to conserve the heat. The attachment to the manifold is made by a compression coupling with a standard 1/4-inch pipe thread and with the inner passage drilled out to 9/32 of an inch to allow the maximum discharge possible.

Tests made by the manufacturers with the Ford installation show that the regular carburetor setting may be cut down at least one-eighth of a turn (45 degrees) with the same effective mixture in the cylinders, as is shown by the fact that even with the reduced consumption there is a slight increase in power and improvement in acceleration. The gasoline saving with this setting is stated to run from four to six miles a gallon.

An important advantage which results from the reduced fuel consumption is the fact that there is less unconsumed fuel to be reckoned with in the cylinder. Unconsumed fuel is dissipated in three ways, all of which are harmful in a different manner. In the first place if the fuel is not vaporized in the cylinder it goes past the pistons to dilute the lubricating oil. The second possibility is that it may be vaporized and the hydrogen content of the gasoline consumed, leaving part of the carbon as a deposit on the cylinder heads and plugs. The third condition is when the carbon in the fuel is only partially consumed, forming carbon monoxide in place of the carbon dioxide which would be the product of complete combustion. This results in a foul-smelling and poisonous exhaust.

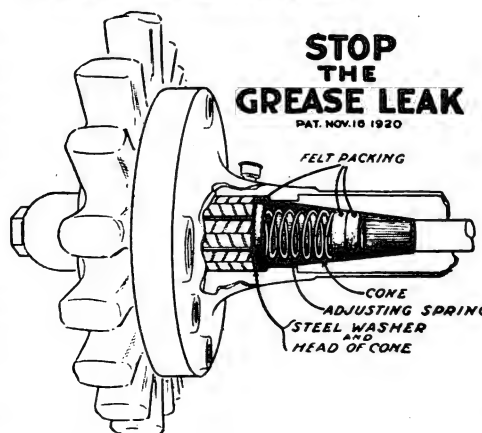
The results of over-richness from poor vaporization are usually manifested in one cylinder more noticeably than the others. This is due to the fact that a considerable part of the fuel reaches the cylinders by creeping along the inside of the manifold wall. In turning in the corners it naturally follows the outside wall and



in entering a pair of cylinder ports is discharged into the cylinder adjacent to this wall. The advantage in vaporizing the fuel before it reaches the manifold lies principally in avoiding this unequal discharge, inasmuch as a vapor can be distributed evenly by a manifold of almost any design.

Manufactured by the **Briscoe Devices Co., Pontiac, Mich.**

The **R & R Automatic Grease Retainers** for Ford and Chevrolet cars prevent the grease leaking through the housing into brake and on to the tires. Almost every Ford owner has had this trouble. The garage man and the owner of a car know that grease destroys tires, renders emergency brakes useless and accumulates horrid masses on the brake drum and wheels. It will be seen at a glance that the axle housing may now be leaking grease, causing the emergency brakes to slip, tires to decay and a waste of grease.



All this trouble, danger and annoyance can be eliminated by installing the **R & R Automatic Grease Retainer**. It can be installed by the owner himself in a few moments, as it requires no special tools or mechanical skill. Simply remove the wheel and roller bearing. It is not necessary to pull out the roller bearing bushing. Insert the **R & R Automatic Grease**

Retainer, replace the roller bearing, the original Ford cap, felt and wheel, and the job is done.

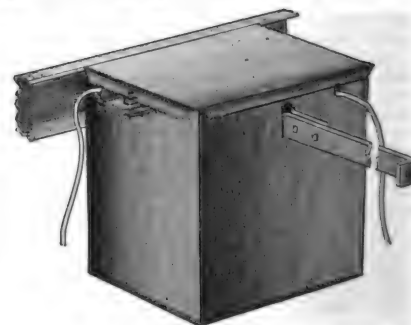
The **R & R Automatic Grease Retainer** puts no wear on the axle and has only one wearing part, which is the smaller pair of felt washers, and is held tight at all times by a spiral spring, which automatically takes up the wear. This spiral spring presses against the steel washer and the small felt washers inside the cone, which keeps an even tension on all the felt washers, preventing any leakage of grease outside or inside the cone.

A set of **R & R Automatic Grease Retainers** comprises two complete retainers and are interchangeable. They can be carried home in a man's pocket and installed as directed.

Manufactured by the **Macorvey Co., Wash Building, Pittsburgh, Pa.** Retail Price, \$2.50 a Set.

The **New Gasco Battery Box** for Ford cars is made to go outside the battery irons, and may be installed in five minutes or less. The box is made of hot-rolled iron, is strong and durable and is painted with acid proof paint. The box has four "break-outs" for the wires, which allows it to be used on old and new style wiring. When installing, two of these may be twisted out for the wires.

A cover is supplied which sets over the box and is held securely in place by the rear floor boards of car, thus eliminating



all chance of rattling. With a **Gasco** battery box the battery will always be clean: mud and dirt thrown by the rear wheels of the car cannot possibly reach the battery and swelling of the wood case is impossible.

Directions for installing—Ascertain by looking at the battery wiring which two "break-outs" are needed—break them out with a pair of pliers. Remove the two retaining bolts on the battery hangers; replace these bolts, first slipping them through the box lips and press the box up over the irons. Replace the nuts and the bottom is in place. The cover simply sets over the bottom and can easily be removed to add water.

Manufactured by **Putney & Conant, Concoctook, N. H.** Sole Sales Agents, **General Auto Specialty Co., 151 Berkeley Street, Boston, Mass.**

(When Writing to Advertisers, Please Mention the Automobile Journal.)

The A-Ford-A-Lock and Gas Saver is stated to combine in the one device: First, a high-grade thief-proof lock; second, a mixing and distributing chamber; third, a fresh air intake, controlled by the speed

tween the carburetor and engine. The gas is broken up and purified in the mixing chamber; hence no carbon forms from the fuel thus purified. It is also stated that, by installing the A-Ford-A-Lock,

per mile, or 76,640 times per hour when driving at the rate of 30 miles. The rapid electric arc created causes heat and with the continuous friction of the roller destroys the metal surface on many standard type timers. When the U. S. Concentric ring is installed as illustrated this friction is eliminated because the ring rolls over the surface of the timer. As this ring revolves in the reverse direction to the commutator roller 104 revolutions per mile or 2600 revolutions per hour, when driving 30 miles per hour, the contacting surface of the ring against the commutator is constantly changing, this equalizes wear and practically eliminates arcing.

These statements are guaranteed by the manufacturer as authentic and cover a long period of experimental and research work, and have been verified by tests on all types of Ford cars, trucks and tractors for 5000 miles and more without any apparent sign of wear. Experimental reports from various sources show that the ignition is always perfect. On a block test the U. S. Concentric ring in 30,000 miles showed no wear on the roller, timer case, or U. S. Concentric Timer ring.

An entirely new roller type timer (Ford preferred) should be used when installing a U. S. Concentric ring. Install the roller



of the engine. The claims made for it include the following: First, that it saves the car from thieves and joy riders; second, saves paying for theft insurance; third, saves enough gasoline to pay for itself; fourth, saves experimenting with the carburetor.

The A-Ford-A-Lock locks the gas be-

The Auto Sun Shield is claimed to eliminate all glare from the windshield, to act as a shield from rain, snow, street lights and head lights, to add safety and comfort and to prevent eye strain. It makes motoring a greater pleasure and is stated to be as necessary as the brakes on a car. The Auto sun shield is not simply a strand of wire covered with awning duck or imitation leather, but is a piece of workmanship, sturdy, beautiful and above all, adjustable to all cars and to all driving conditions.

When attached the Auto sun shield becomes a part of the car. The workmanship, material and design add greatly to the appearance of any car. Each shield is a perfect fitting model, and is made to conform with the graceful lines of the modern American car. It is built to stand up under all road and weather conditions.

The Auto sun shield is as rigid as steel, therefore, vibration is entirely eliminated, and there is no sag, flap or any wrinkles. The side arms are of heavy brass, rust-proof and the clamps and brackets are brass, baked enamelled. The top is of high-grade black fabric material, and the underside is green, giving a restful effect and preventing eye strain. These two fabrics are reinforced with a patent warp-proof and non-shrinkable panel board.

The open car model is in reality a double shield. The part extending forward of the windshield protects the occupants of the driver's seat from the glare of the sun and the elements. While the rear extension is primarily a means of keeping the sun shade taut and rigid, it also closes up or seals the space between the upper part of the windshield and the bow of the top, which affords protection from overhead drafts and the dust of the road when driving with the windshield open.

The closed car model is designed to attach to the uprights or side frame of the sedan or coupe by slotted brackets with three wood screws in each. The brackets are made to fit snugly up under the eave of the car body and the shield can be at-

many faults attributed to the carburetor, which are in reality above the carburetor, are corrected, and the expense of adjusting or changing carburetors is avoided.

Manufactured by the Afordalock Co., 729-31 West Broadway, Council Bluffs, Ia. Dealers and agents are invited to write for liberal proposition.



tached to or removed from the brackets in a few minutes. The closed as well as the open car shield has no angle rods or side pieces to obstruct the driver's view when turning corners.

The Auto sun shield is made for a variety of the principal makes of cars on the market, both open and closed.

Manufactured by the Auto Sun Shield Corporation, East Orange, N. J. A list of cars for which it may be supplied at once, together with prices, will be supplied on request. When ordering, the name and year of car should be given and in closed cars whether for coupe or sedan.

The U. S. Concentric Timer Ring is an ingenious simple U. S. letter patent device made especially for the Ford timer, but is applicable to any standard type of roller timer of Ford style. The wear on the Ford timer is caused by the rapid and continuous electric arc and the friction of the roller on the stationary timer case. A timer on the Ford car revolves 2558 times



in a horizontal position up, as illustrated, then hang the U. S. Concentric ring on to the roller, put the timer case in place and fasten. Oil the timer at least once a week.

On timers other than "Ford" make, see that the roller fits into the U. S. Concentric ring before installation, because it may be necessary to file off some of the projecting metal near the little spring on the roller.

Manufactured by the U. S. Auto Equipment Co., Milwaukee, Wis. Price, 50 cents each.

The Dover Five-Gallon Measuring Can is an automatic device for testing gasoline pumps. The stock number of this can is 350. The can is 24 1/2 inches high over all and 10 1/2 inches in diameter. The



top is made cylindrical in shape and has at one side a gauge, calibrated in cubic inches, which shows at a glance the errors and the correct amount over or under.

It is claimed that this device eliminates the use of a glass graduate in determining variance or error of gasoline measuring pumps and that the gauge is adjustable and removable.

Manufactured by the Dover Stamping Co., Cambridge, Mass. Price on request.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

The Hammond Never Slip Portable Crane is a hoist of the worm and screw type, made entirely of steel—a steel column mounted on four wheels, Hyatt equipped, steel base. The worm and gear type hoist, enclosed and running in oil, permits the load to be raised, lowered and firmly held



at the precise point desired without the use of the locking device. It will hold its load stationary at any point of travel, as it is not governed or limited by any dog, pawl or locking device.

This type of hoist eliminates the old style ratchet and pawl and reduces the possibilities of accidents to a minimum.

Distributed by the Barrett-Cravens Co., 169-173 North Ann Street, Chicago, Ill.

EverReady Solid Woven Brake Lining and Clutch Facings are scientifically manufactured by an organization with 13 years' experience in the development of asbestos fabrics, and it is claimed that their superiority is proven by practical tests. The EverReady lining is woven



from Canadian long-filled asbestos, wound around brass wire of great tensile, on specially constructed looms to produce a solid, compact fabric.

After being woven to a width and thickness considerably greater than the required dimensions, the fabric is impregnated through and through with a special chemical friction compound. It is then baked for a long period, at a carefully determined temperature, after which it is passed between heavy steel rolls, and brought down to exact size and compressed into a solid mass which retains its frictional properties until worn to the

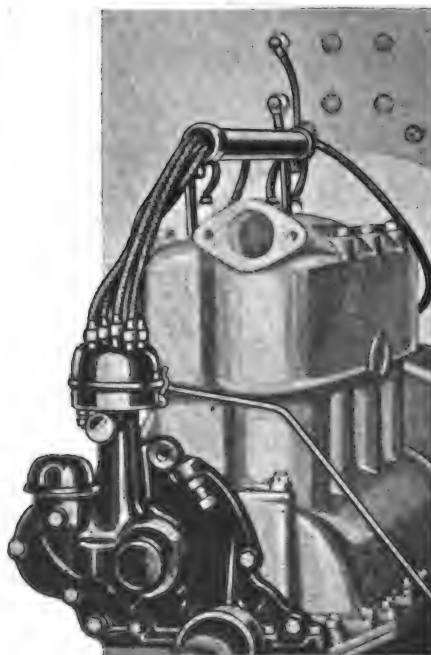
(When Writing to Advertisers, Please Mention the Automobile Journal.)

last strand. EverReady solid woven asbestos brake lining is guaranteed for one.

Manufactured by the Kelso Manufacturing Co., Trenton, N. J. Prices and other information at request.

The Thomas Ignition System for Ford cars is stated to compare favorably with the grades used on the higher priced cars. The accompanying illustration shows it installed on the Ford motor. It will be noted that the distributor casting conforms accurately to the Ford timing gear case. The distributor casting raises the distributor cap up where it is accessible and away from dust, grease, oil, water and mud. It is supplied with an overhead wiring system which is similar to the system used on high priced cars. The distributor shaft is driven by two hardened steel spiral gears of 12 pitch, being 1 1/2 inches outside diameter. These gears are constantly lubricated from the splash of the motor. The upper part of the distributor shaft bearing has an auxiliary grease cup.

It is not necessary to time the gears when installing this system on the motor, as the motor can be timed instantly after the complete system is installed. The hardened steel cam on the top of the distributor shaft rotates against a fiber block, opening the points. The breaker



points and felt oiler are all mounted on one small movable plate, which is held in position by three screws at the top of the distributor casting. The breaker arm that carries the one moving point can be adjusted vertically and laterally so that the points can be set in perfect alignment at any time and stay set until changed. The distributing brush is of genuine bakelite and the plunger of this brush is hardened steel, which rotates on a hard rubber track that is moulded integrally with the bakelite cap.

This system does away with three of the four vibrating coils. This gives one set of points, one breaker arm, one tension on the arm, one cam, one distributor brush, one primary and secondary winding to handle the sparks of all the cylinders, which assures each cylinder receiving exactly what the other cylinders receive, and at the right time.

Manufactured by Thomas-Andrews Corporation, Waukegan, Ill. Price, completely equipped for installing, \$20.

The Stone Steel Service Cabinet offers the most highly developed method of storing, displaying and selling the well-known Stone rim parts. It is built of

steel, is finished in a handsome combination of dark olive green and white, and is amply strong to endure hard service. Removable labels make this cabinet adaptable to any variety of parts desired. The chart on each side, which is also remov-



able, gives complete and accurate information, insuring prompt service and satisfied customers.

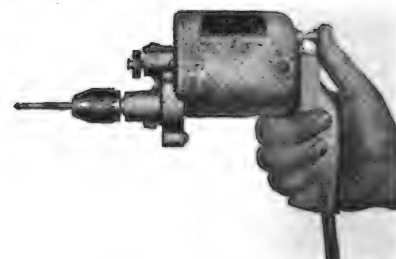
The dimensions of the Stone Steel Service cabinet are 5 1/2 by 17 by 26 inches, and its weight is only 15 pounds.

The manufacturer of Stone rim parts offers this cabinet free to dealers with either the No. 1 or No. 2 assortment of parts, which contains 37 items for practically every car, including the latest models.

Manufactured by the Stone Manufacturing Co., Chicago, Ill. Description and prices of parts supplied on application.

The One-Hand-Y Electric Drill is extremely light in weight and efficient, and it is designed for small work. It can be used in a small shop, or for general manufacturing purposes, where the drill can be taken to the work. It is especially useful in drilling holes for cotter pins, name plates, or any small holes in metal, boring holes for wood screws in cabinet work, etc.

The drill housing is made of aluminum and the pistol grip is designed to fit the hand perfectly. As the grip is on a direct line with the chuck, a straight line pressure is given on the drill bit, thus eliminating the danger of side strain. A switch



button operated by the thumb controls the power so that the motor cannot run idle when not in use. The drill is driven by a Westinghouse universal A. D. S. type motor. It is claimed that this drill will carry a 1/4-inch drill bit through steel as fast as the work requires at a chuck speed of 900 revolutions per minute.

Manufactured by the Knight Engineering & Sales Co., Los Angeles, Cal.

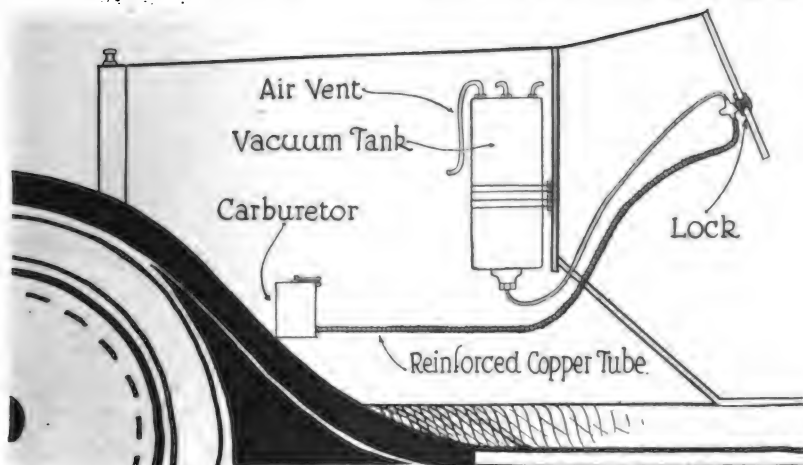
The Fisher Auto Locking System consists of three locks, all operated by the one key, a gasoline lock and two hood locks. The gasoline lock is installed on the instrument board, within easy reach from driver's seat. It shuts off the gasoline at the carburetor, making it impossible to operate the car when the key is withdrawn from the lock; it also stops all leaks from defective carburetors.

lifting of the distributor cap, when the motor is idle, breaking all ignition connections. With a device furnished with each equipment the owner is able to lock the steering rod under the hood. This means that the gasoline, the ignition and the steering rod all can be locked, and the same key does it all.

In addition to protecting the car against theft, the Fisher locking system prevents

is said, also makes it easier to shift gears, and that, in addition to permitting the motor to run evenly under all sorts of driving conditions, this device eliminates a large amount of the nervous tension of driving by doing away with the necessity for maintaining a perfect balance at all times with the accelerator foot.

The device is arranged with adjustments so that it can be attached to any car

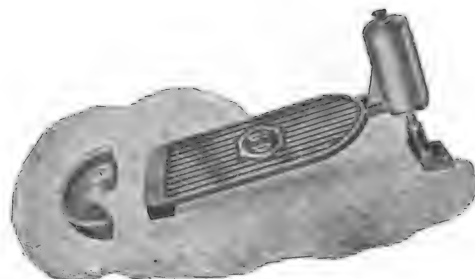


The hood locks are attached to the hood, one on each side, securely locking into a strong angle iron, which is bolted to the chassis under the hood in a position impossible to reach from the outside of the car. These hood locks play an important role in the protection of the car against theft. First, they prevent any possibility of cutting, or reconnecting gasoline tubes, independently of the gas lock, this leaving no way of putting gasoline in the carburetor. Secondly, the ignition is greatly protected, as it prevents the jumping of the wires from the batteries to the distributor and also permits the

borrowing gasoline, spark plugs and any other removable parts located under the hood. Any person familiar with the system used by inter-state thieves will also appreciate the merits of this locking system.

That there is good foundation for the claim that this lock is positively pick-proof cannot be doubted by anyone who will closely examine its key, and \$1500 is offered by the manufacturer to any locksmith who will duplicate one of these keys.

Manufactured by the Lefebvre Manufacturing Co., Inc. of Boston.



which now has an accelerator and the De Luxe model, which is now on the market, is of polished aluminum and is exceptionally attractive in appearance.

It is understood that a special Ford model will soon be announced which will be supplied complete with all rods and levers for installing on Fords which have no accelerators. The De Luxe model will fit Fords that are provided with an ordinary accelerator.

Manufactured by the Black & Decker Manufacturing Co., Towson Heights, Baltimore, Md. Retail list price, \$9.50.

Hunt's Self-Adjusting Gear Puller possesses many novel features that will appeal to the wide-awake repair man. It is instantly adjustable without changing any pins or set screws, and one of the big features is the harder one pulls the tighter it grips the gear he is pulling. The pulling arms are made of a specially prepared steel that will withstand the grief that the average gear puller is subjected to. In addition to this a special process of heat treatment is given them to add to their tensile strength. The screw is the famous

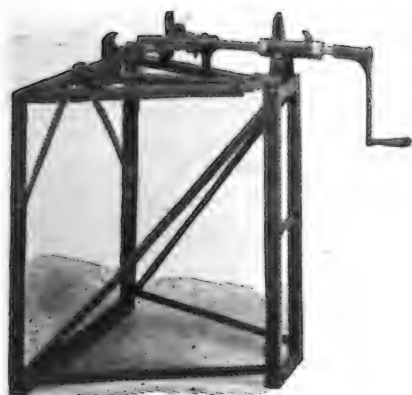
The Little Giant Rim Tool is designed all to handle the most difficult tasks in expanding and contracting the different split rims used today. Repair and garage men are quick to appreciate the value and economy of this device. The investment involved will be saved a good many times figuring the cost of time, labor and damaged rims.

The stand is built of strong steel angles with proper reinforcements. A one-inch spindle with a square thread is provided, which positively will do the work required of it. The gripping parts are made of

times. This prevents damaged or sprung rims. The mechanism of the tool is very simple; nothing to break or get out of order. The tool is guaranteed against defect in workmanship or material.

The Little Giant will handle all styles and sizes of split rims made. The machine comes knocked down into a comparatively small box, simple to set up.

Manufactured by the Marquette Manufacturing Co., St. Paul, Minn.

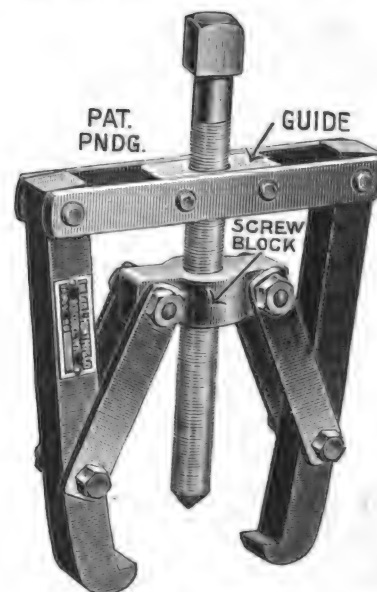


high-grade malleable iron. Nothing but heavy, durable material is used throughout.

The tracks or slides in which the arms travel prevent the tool from buckling or the arms from sliding. The distances between the gripping points are equal at

The Black & Decker Cushion Accelerator is a device consisting of a large polished aluminum pedal, which is hinged to the floor or toe board of an automobile and is provided with an air cylinder which operates over a piston attached to the toe board. The bottom of the pedal rests upon the standard accelerator with which the car is equipped. When the pedal is pushed down the air in the cylinder is forced through a valve at the top and when the pedal is allowed to return the air is drawn back into the cylinder. A spring lock valve at the top of the cylinder makes it possible by a turn of the thumb and forefinger to restrict the orifice through which the air passes until the exact degree of cushioning desired is obtained.

It is claimed that a great improvement is effected in the even running of the motor, particularly when driving over bumpy roads and crossings, as the device is designed to eliminate "fluttering" of the throttle, which is unavoidable with the ordinary accelerator, owing to road inequalities disturbing the balance of the operator's accelerator foot. It is claimed that the cushioning device eliminates this almost entirely. The cushioning effect, it



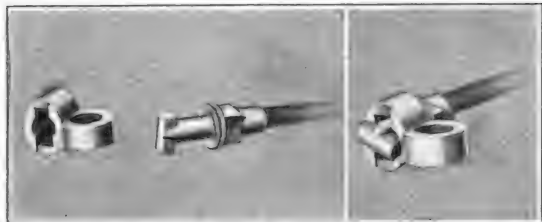
Mac-It screw, absolutely guaranteed not to twist off or strip the threads. This puller is made in three sizes, Nos. 10, 20 and 30. The No. 10 will take a gear up to six inches in diameter, the No. 20 up to nine inches and the No. 30 up to 18 inches in diameter. The No. 30 is also excellent for pulling all sizes of wheels.

Made by the George L. Hunt Manufacturing Co., Inc., Roscobel, Wis. Prices and literature on application.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

The F & M Non-Corrosive Self-Locking Battery Terminal offers a simple, practical method of locking a non-corroding soft metal battery terminal without the aid of nuts, bolts, screws or wedges. The connectors, it is stated, can be disconnected in a second or two, while a slight turn of the terminal locks the connector in place.

As the terminal ends are of lead, the soft metal of the terminal seats readily



and is not easily jarred loose by vibration, making a joint which does not sulphate and forms a clean connection.

The battery connectors are burned to the battery posts in the usual manner and the only tool necessary for removing the terminals is an ordinary open-end wrench such as is carried in the car tool kit.

Manufactured by Fraser & Marsh, 347 Naugatuck Avenue, Devon, Conn. Prices and literature on request.

The Aermore Exhaust Horn, designed with a special valve fitting, is now available for tractor use and offers a unique solution of warning the operator when trouble occurs on the machine which requires the shutting down of the tractor, or for other signalling purposes.

The tone of the Aermore horn is pleasing to the car and its penetrating four-



The AERMORE Exhaust Horn

toned sound may be heard a mile or more, but at the same time is not shrill enough, the manufacturer claims, to scare horses.

Manufactured by the Fulton Co., Milwaukee, Wis. Prices and literature on request.

The Victor Gasket-er is a patented silent gasket salesman or cabinet which is placed on the show case or other convenient location and shows at a glance the various sizes and types of Victor gaskets which are made for tractors, trucks and passenger cars.

The case or cabinet is strongly built of one-half inch material, finished in mahogany and is fitted with substantial fiber dividers which keep the sizes separate. On the inside of the cover are displayed samples of gaskets carried in stock, each gas-



ket burnished and lacquered to retain the high finish, and are set in a background of artificial leather. The gaskets are filed

numerically while in front of the first divider is a Victor gasket list in which the number of a gasket called for can be readily found.

The cabinet contains 30 different types and sizes of copper asbestos gaskets used in over 140 different makes of cars, trucks or tractors.

Manufactured by the Victor Manufacturing & Gasket Co., 5750 Roosevelt Road, Chicago, Ill. Price on application.

Splitdorf Spark Plugs are made in a variety of types in standard sizes and of special dimensions to suit engines of every make. Ruby India mica is used exclusively as insulation and is unaffected by heat, as well as fibrous, tough and unbreakable.

Splitdorf spark plugs are not only leak-proof when made, but every explosion of the engine cylinder, it is stated, tightens them. The green jacket adds neatness and appearance to the plug, but has noth-



ing to do with its functioning.

Splitdorf Green Jacket Plugs are easily disassembled for cleaning by using two wrenches to loosen the lock nut, which fits against the copper-asbestos gasket.

Manufactured by the Splitdorf Electrical Co., 98 Warren Street, Newark, N. J. Prices and literature on request.

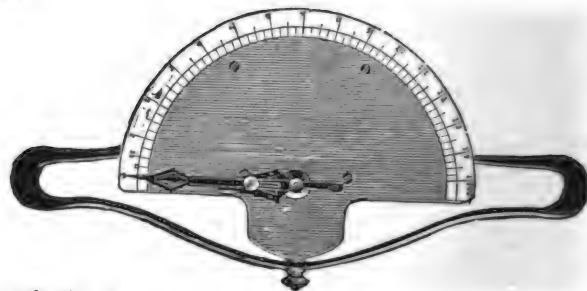
The Sharon Brute Trailer is especially designed for heavy duty service with tractors in warehouses, terminals and transfer stations and the trade name "Brute" is descriptive of its unusually strong construction.

The frame is made up of 4 1/2-inch chan-



nel sections pressed from 1/2-inch hot rolled open-hearth steel, rivetted into one-piece channel section with the corner pieces pressed to a six-inch radius, with a

The Chatillon Dynamometer is designed to indicate in an accurate manner, by means of a spring indicator and dial, the number of pounds pull or torque exerted by an engine drive shaft at certain speeds. The instrument may be used either in connection with the Prony brake method of determining horsepower and torque, or may be used with electric or water dynamometer acting as a spring balance,



which measures the pounds pull exerted through an arm of predetermined length.

Manufactured by John Chatillon & Sons, 85-93 Cliff Street, New York City. Prices and literature on request.

hole for a stake pocket. By varying the length of the side and end rails the "Brute" can be made in any length up to 72 inches and in any width up to 50 inches.

Two additional members, running lengthwise beneath the floor, are of three-inch pressed steel channel, rivetted to the end rails and braced laterally to the frame with front and rear pressed steel "V" braces which take the pull of the 1/2-inch steel forged coupler. Either one or two couplers can be supplied.

The rear wheel and front caster supports are three-inch pressed steel channels rivetted to the side rails and longitudinal members of the frame. The rear wheel brackets are pressed from 1/4-inch steel with two stiffening ribs on each side, a construction at least twice as strong as any malleable casting. The rear wheels are of malleable iron with six double-web spokes and a 3 1/2-inch face, with three-inch Hyatt roller bearings on a one-inch shaft, hardened and ground.

The front casters are of heavy-duty type, ball and roller bearing equipped, bolted to a 1/2-inch steel plate rivetted to the frame. The floor of the trailer is 1 1/4-inch oak recessed flush in the side and end rails. All frame members are flush on the



bottom, thus affording an even support when the trailer is used in connection with a lift truck.

The "Brute" trailer was recently given a severe road test with a load of 8000 pounds, which revealed no weaknesses, it is stated, and which indicated its adaptability to the most exacting service.

Manufactured by the Sharon Pressed Steel Co., Sharon, Pa. Prices and literature on request.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

The Model TF-5 Electric Test Unit will test the complete Ford F-A starting and lighting units and their component parts such as armatures, field coils, relays, ammeters and switches. The equipment includes a one-third horsepower variable speed Universal type alternating or direct-current motor with a range from 300 to 3000 revolutions a minute; voltmeter with a range from 0 to 15 volts; ammeter with double range, 30-0-3 and 600-0-600; tachometer with a range of 300 to 3000 revolutions a minute; flexible coupling; brake arm, brake pulley and scale for starting motor tests; multi-speed controller; armature test; test lamp; six-volt battery.

This unit is equipped with a special motor having a constant speed at any given revolutions a minute. The controller for varying the speed of the motor is graded to a very close range. The Model TF-5 has a high-grade, flexible coupling which



takes the generator, either with the gear assembled or without, and does not mar the shaft or gear. The same coupling will also take the starting motor shaft; and integral with the coupling is a brake for the starting motor test. This brake permits the service station to obtain both stall torque and running test on starting motors. This feature is very desirable, due to the fact that if, at normal cranking speed, the commutation on the motor is not perfect, the car owner is liable to have trouble with his starter, and by taking the stall torque only the desired results may not be obtained. By this arrangement, speed, amperage and voltage readings of starting motors are given, the same as on generator tests.

The Model TF-5 is also equipped with an armature test, commonly called a "growler." This growler is built integral with the generator and motor bracket support. A test lamp is furnished for testing opens and grounds, and is so mounted that there is no danger of its becoming accidentally broken. The battery is supported in the base, which also supports the controller.

Another feature of this unit is the simplicity of wiring, there being only three leads for making both motor and generator tests. The unit is of all-metal construction.

Manufactured by the Service Products Co., Springfield, O.

The Barnes Cylinder Boring Attachment fits the Barnes 14-24-inch and also the 13-22-inch sliding extension gap lathes. As will be seen from the accompanying illustration, the attachment permits of reboring all sizes and styles of automobile cylinders. The work can be accurately done in this way and after setting up the job it requires less than five minutes to take a cut through a four-inch cylinder, such as in the Fordson tractor block shown. This equipment eliminates investing in an expensive cylinder boring machine or grinder.

The attachment consists of an angle bracket to be clamped on the carriage of the gap lathe, which bracket carries a hardened bushing supplied for the boring bar; 2½-inch diameter boring bar with Morse taper shank to fit spindle; high speed steel cutter and draw bolt through

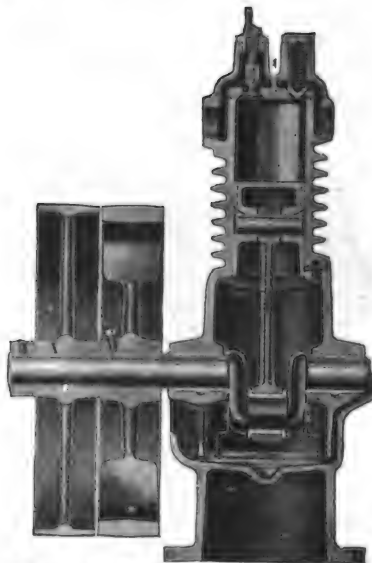
the spindle for positive drive; a taper bushing, which slides into the old hole to assist in centering the cylinder and supporting bolts for steadying the outer end of the cylinder are also included. These bolts screw into the angle shoe which slides along in the gap on the ways of the main bed.



By means of the sliding extension gap feature of the lathes, cylinders of all shapes can be handled, such as the Fordson tractor and Ford automobile cylinder blocks. The Barnes extension gap lathe is one of the most useful machines in the garage and with a slight additional outlay this attachment and the milling attachment can be applied, making a universal machine for cylinder reboring, milling jobs, as well as for all kinds of lathe work. It would be impossible to apply this attachment to a standard 14-inch or 15-inch lathe because the cylinder block generally requires the extension gap.

Manufactured by the Barnes Drill Co., 814-830 Chestnut Street, Rockford, Ill.

The Curtis Compressor has a patented controlled splash oiling system. The cross section illustrated here shows the general construction of the Model B, indicating particularly the method of the system found exclusively in these compressors. Note the oil level in the crank case. A high and low level filling gauge is furnished which does not permit too much oil being put in. By looking into the filler it may be known when it is necessary to refill the crank case with oil. Neither the connecting rod nor the crank shaft dips into the oil, but on the crank shaft two knife blade attachments dip down with each revolution of the fly wheel and pick up a drop of oil as it passes through and throws it off on to the ribs cast on the upper half of the crank case and also on to the little pin which is



shown extending through the lower end of the cylinder wall.

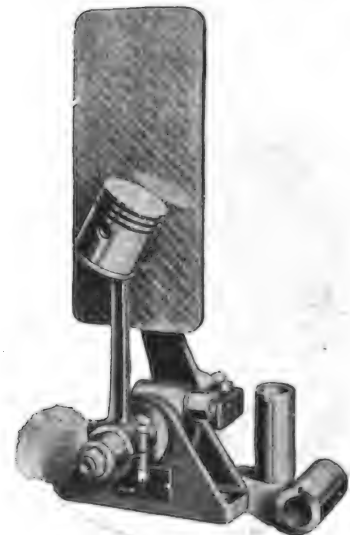
This little pin is stated to be the secret of the manufacturer's slogan, "Curtis Air—Free from Oil." After much experimenting, just the right size pin is used so as to collect the proper amount of oil necessary to lubricate the cylinder of the compressor no matter how much is thrown on it. The oil that it does collect runs off the end of the pin through a small hole in the cylinder wall; is wiped off by the piston on its down stroke and carried up along the cylinder wall, then around the wall, where it finds its way into an oil groove around the piston underneath the lower ring; thus supplying every part of the cylinder wall with proper lubrication. There are also two oil ducts leading from the oil groove which lubricate the upper piston pin. It is claimed that the pin cannot and will not collect and deliver an excess of oil to the cylinders to blow over into the discharge line and rot the inner tubes of automobile tires.

Another feature claimed for this patented oiling system is that one filling of the oil will run a Curtis compressor 10 to 15 times as long as the ordinary splash oiling type of machine where the connecting rod splashes the oil promiscuously over the interior and even the exterior of the machine.

This knife blade and collector pin oil-throwing system is stated to be a patented feature found exclusively in Curtis air compressors. It likewise makes it specially suited for water systems, die casting work, air brush painting and the like, because of no excess material getting into the discharge line.

Manufactured by the Curtis Pneumatic Machinery Co., St. Louis, Mo. Full information on request.

The Thomason Piston Aligning and Bearing Fitting Fixture, shown in the illustration, is similar in action to the aligning jig made by the same concern with the exception that the aligning plate, with its supporting arm, can be swung to one side or entirely removed. With this fixture a sleeve four inches long is



used. It has a keyway engaging with a key in the base which keeps it from turning when used as a bearing fitting fixture. The standard arbor, when sleeves are used, is 1¼ inch. The fixture can also be supplied with solid arbors of various sizes. All arbors are hardened and ground. The use of ground sleeves is advised, as they are much more accurate than when turned in a lathe. All sizes are carried in stock.

Manufactured by the Shepard-Thomason Co., 506-508 West Pico Street, Los Angeles, Cal. Distributed by the Chasler & Lyon Co., with offices at Los Angeles, Cal.; Fresno, Cal.; San Francisco, Cal.; Seattle, Wash., and Tacoma, Wash.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

The Gas-O-Meter, shown herewith, is built for every type of car except those having the gas tank inside the cowl. It is made in two sections, the indicator in the tank, and the meter proper, located on the instrument board. The indicator consists of a copper, air-tight float, attached to a



steel shaft, and its operation is similar in principle to the usual form of gasoline gauge. The float rises or falls in the tank as the gas raises or lowers. This operates a shaft within the main indicator shaft through the medium of two brass milled bevel gears. This shaft is mounted upon two bearings. The inside shaft actuates an arm within the indicator head and causes it to touch upon electrical segments, separate and distinct for each division of the gasoline supply. This is the plan followed for measuring the gasoline supply. As the float rises or falls it turns the indicator arm to the segment, showing its location in the tank—empty, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ or full—and as each segment is connected separately to the dash instrument, the connection established by this indicator arm is in turn shown upon the dash instrument or meter.



The indicating apparatus, which is carefully built and fool-proof, is inserted in the tank in place of the present gasoline gauge. From it is run a linen-bound, water-proof cable containing five wires, which passes under the car to the dash instrument. A connection is established between the dash instrument and the ammeter and, when the button in the center of the dash instrument is pressed, the height of gasoline in the tank is shown by means of an illumination under the section of the dial which corresponds to the height of gasoline in the tank. Both eighths and quarters register on the meter. When the tank registers $\frac{1}{4}$, both

empty and $\frac{1}{4}$ burn. When $\frac{3}{4}$, both $\frac{1}{4}$ and $\frac{1}{2}$ burn.

The meter measures $3\frac{1}{4}$ inches over all. It is composed of the usual connections for the cable at the back, with each connection fool-proof—the cable consisting of five separated colored wires, and the con-

nections on the head colored correspondingly. There is a resistance coil in the head, which "steps down" the current to 2½ volts.

Small flash light bulbs are used under the etched German silver dial, and these are easily replaced at any hardware, drug or accessory store. On account of the limited use of the bulbs they will last for many months of hard service before replacement is required.

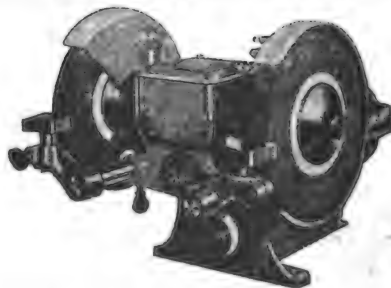
The device is not "alive" except when the button is touched, as the cable is "dead" between the dash instrument and tank, and grounded. No spark can be produced, as it is a well-known fact that 3½ volts or more are required before a spark may be obtained. Neither can any live current reach the tank, as this is prevented by the "dead" cable. The dial is protected from exposure by a $\frac{1}{4}$ -inch plate glass crystal, and the head is held in place on the dash by three screws.

The Gas-O-Meter is built with the same sized head for all cars, having the gas tank at the rear, and with shafts and indicators of different lengths as the depth of gas tanks vary on the different models.

Manufactured by the Mid-West Glass Co., Cincinnati, O.

The Black & Decker Eight-Inch Electric Bench Grinder is a substantial two-wheel outfit having a three-quarter horsepower motor of the universal type, similar to the motors used in the Black & Decker portable electric drills. These motors operate on alternating or direct current at will.

Among the accented features of this new model is the arrangement of the grinding



wheels, which are set well forward of the motor casing and arranged so that they overhang the bench. This makes it possible to grind long pieces and odd shapes with unusual facility and also to wear the grinding wheels down to the clamp

washers, thus avoiding wastage of wheels.

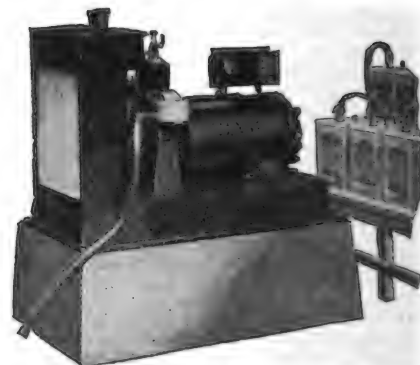
The motor is air-cooled and is arranged so that the cooling air intake is located 12 inches from the grinding wheels in order to reduce the possibility of grit being drawn into the machine. The machine is grease lubricated throughout.

A departure has been made from the customary practise of supplying the bare grinder only and this machine is shipped as a complete outfit with two grinding wheels, eight inches in diameter and three-quarter-inch face, one coarse and one fine; two wheel guards; two adjustable tool rests and an electric cable fitted with attachment plug and switch. It is shipped ready to run as soon as the plug is connected and is distributed through the Black & Decker chain of jobbers.

Manufactured by the Black & Decker Manufacturing Co., Towson Heights, Baltimore, Md. Price, for 100-volt, \$120; can be supplied for 220-volt at a small extra charge.

The New Main Power Light Plant consists of a simple gasoline engine using either gasoline or kerosene as fuel, with but three moving parts, a generator of standard make and an automatic control board with meter. A few points of superiority claimed for it are its simplicity, reliability and compactness. It is low in cost and upkeep and will not over-heat.

It is built in two sizes, the specifications being as follows: One kilowatt outfit—Engine, two horsepower, single-cylinder, 2½ by 2½ inches; main bearings, 3¼ inches long, highest grade; two-cycle, water-cooled through high-grade honeycomb radiator employing fan of crank shaft; holds but two gallons of water. Lubrication, oil mixed one part to 10 parts of fuel; positive lubrication assured; fuel



tank in base, passing fire underwriters' inspection. Ignition, jump spark coil and timer mounted on crank shaft. Carburetor, approved type. Fuel consumption, one gallon will operate engine from six to eight hours. Speed, 1200 to 1600 revolutions a minute according to load. Generator, improved type, laminated fields; oil ring type bearings; internal fan mounted on armature shaft; rating, 1000 watts. Battery, 16 cells, sealed glass jar type; original Main thick plate type; 100 lamp-hours capacity (20-watt lamps), or 60 ampere-hours, S. A. E. or intermittent rating. Shipping weight complete with 60 ampere-hour battery, 575 pounds. Dimensions, base, 12 inches wide by 34 inches long by 24 inches in height. The specifications of the 1½-kilowatt type are practically the same as for the one-kilowatt, only it has a steel frame generator, giving far greater efficiency, employing ball bearings. This set operates at 1500 to 1750 revolutions an hour and the engine develops 2½ horsepower. The battery is 90 ampere-hours, 16 cells, 32 volts; shipping weight about 750 pounds.

Manufactured by the Main Electric Co., Cleveland, O. Prices: One-kilowatt sine, \$295; 90 ampere-hour battery supplied at \$40 list additional, and 100 ampere-hour battery at \$75 additional. 1½-kilowatt sine, \$450; 100 ampere-hour battery at \$35 list extra; 225 ampere-hour battery at \$75 extra.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

Recent Revisions of Car Prices

| Make and Model | Old Price | New Price | De-crease | Make and Model | Old Price | New Price | De-crease |
|------------------------------------|-----------|-----------|-----------|-------------------------------|-----------|-----------|-----------|
| Allen Touring | \$1395 | \$1195 | \$200 | Ford Runabout | 370 | 325 | 45 |
| Allen Special Touring | 1695 | 1495 | 200 | Ford Touring | 415 | 355 | 60 |
| Allen Sedan | 2195 | 1845 | 350 | Ford Truck Chassis | 495 | 445 | 50 |
| Allen Special Sedan | 2395 | 2195 | 200 | Ford Coupe | 595 | 495 | 100 |
| Ambassador Touring | new | 4500 | ... | Ford Sedan | 760 | 660 | 100 |
| Ambassador Sedan | new | 6500 | ... | Franklin Touring | 2650 | 2350 | 300 |
| Anderson Touring 5-pass. | 1795 | 1650 | 145 | Franklin Roadster | 2550 | 2300 | 250 |
| Anderson Touring, 7-pas. | 1545 | 1795 | 50 | Franklin Sedan | 3650 | 3350 | 300 |
| Anderson Sedan, 5-pass. | 2795 | 2550 | 245 | Franklin Brougham | 3550 | 3250 | 300 |
| Anderson Sedan, 4-pass. | 2795 | 2450 | 345 | Grant Special Touring | new | 1285 | ... |
| Anderson Sport Tour. 4-pass. | 1845 | 1750 | 95 | Hanson Six Touring, 5-pass. | 2365 | 1795 | 570 |
| Anderson Sport Spec. 4-pass. | new | 1850 | ... | Hanson Six Touring, 7-pass. | 2465 | 1895 | 570 |
| Apperson 8-21 Touring | 3500 | 3250 | 250 | Hanson Six Roadster, 2-pass. | 2365 | 1795 | 570 |
| Apperson Anniversary Touring | 4250 | 3750 | 500 | Hanson Six Sport, 5-pass. | 2465 | 1895 | 570 |
| Auburn Sedan | 2795 | 2495 | 300 | Hanson Six Coupe, 4-pass. | 3465 | 2775 | 690 |
| Auburn Touring | new | 1695 | ... | Hanson Six Sedan, 5-pass. | 3565 | 2885 | 680 |
| Auburn Sedan | new | 2495 | ... | Haynes 55 Touring | new | 1785 | ... |
| Beggs Touring | 1775 | 1520 | 255 | Haynes 55 Sedan | new | 2835 | ... |
| Beggs Sedan | 2775 | 2420 | 355 | Haynes 75 Touring | new | 2485 | ... |
| Briscoe Touring | 1285 | 1085 | 200 | Haynes 75 Sedan | new | 3485 | ... |
| Briscoe Sedan | 1885 | 1685 | 200 | H. C. S. Touring | 2975 | 2775 | 200 |
| Buick Four Touring | new | 975 | ... | H. C. S. Sedan | new | 3650 | ... |
| Buick Four Sedan | new | 1650 | ... | Holmes Touring | 3350 | 2950 | 400 |
| Case 4-Passenger | 2250 | 1935 | 315 | Holmes Sedan | 4550 | 4150 | 400 |
| Case 7-Passenger Touring | 2250 | 1935 | 315 | Hudson Touring | 2250 | 1895 | 355 |
| Case Sedan | 3285 | 2970 | 315 | Hudson Sedan | 3250 | 2895 | 355 |
| Chalmers Roadster | 1495 | 1245 | 250 | Hupmobile Roadster | 1485 | 1250 | 235 |
| Chalmers 5-Passenger Touring | 1545 | 1295 | 250 | Hupmobile 5-Passenger Touring | 1455 | 1250 | 235 |
| Chalmers 7-Passenger Touring | 1795 | 1395 | 400 | Hupmobile Coupe | 2200 | 2100 | 100 |
| Chalmers Coupe | 2295 | 1995 | 300 | Hupmobile Sedan | 2250 | 2150 | 100 |
| Chalmers Sedan | 2445 | 2295 | 150 | Jackson Touring | 1950 | 1635 | 315 |
| Chalmers Sport | 1695 | 1445 | 250 | Jackson Sedan | 3750 | 2985 | 765 |
| Champion Touring | 1250 | 1095 | 155 | King Touring | 2225 | 2125 | 100 |
| Champion Special Touring | 1595 | 1395 | 200 | King Sedan | 4035 | 3235 | 800 |
| Chevrolet 490 Touring | 625 | 525 | 100 | Kissel Standard Touring | 2775 | 2475 | 300 |
| Chevrolet 490 Roadster | 625 | 525 | 100 | Kissel De Luxe Touring | 3475 | 2975 | 500 |
| Chevrolet Coupe | 975 | 875 | 100 | Kissel De Luxe Sedan | 4275 | 3775 | 500 |
| Chevrolet 490 Sedan | 975 | 875 | 100 | Kline Touring | 2290 | 2090 | 200 |
| Chevrolet FD Touring | 1185 | 975 | 210 | Liberty Touring | 1860 | 1595 | 265 |
| Chevrolet FD Sedan | 1885 | 1575 | 310 | Liberty Sedan | 2900 | 2495 | 405 |
| Cole 870 Touring | 2795 | 2485 | 310 | Locomobile Touring | 8680 | 7600 | 1000 |
| Cole Sedan | 3995 | 3655 | 340 | Locomobile Sedan | 11,700 | 11,000 | 700 |
| Columbia De Luxe Tour. 5-pass. | 1795 | 1495 | 300 | Malbohm Touring | 1575 | 1395 | 180 |
| Columbia De Luxe Sport 4-pass. | 1795 | 1495 | 300 | Malbohm Sedan | 2395 | 2295 | 100 |
| Columbia De Luxe Roadster 2-pass. | 1795 | 1475 | 320 | Maxwell Touring | 845 | 885 | *40 |
| Columbia De Luxe Coupe 4-pass. | ... | 2295 | ... | Maxwell Roadster | 845 | 885 | *40 |
| Columbia De Luxe Sedan 5-pass. | 2595 | 2350 | 245 | Maxwell Coupe | 1445 | 1385 | 60 |
| Columbia Challenger, Tour. 5-pass. | 1495 | 1195 | 300 | Maxwell Sedan | 1545 | 1485 | 60 |
| Columbia Challenger Coupe, 4-pass. | 2295 | 1995 | 300 | Mercedes, All Open Models | 4500 | 3950 | 550 |
| Columbia Challenger Sedan, 5-pass. | 2295 | 1995 | 300 | Mercedes Limousine | 6200 | 5650 | 550 |
| Davis Six Touring | 2185 | 1695 | 490 | Mercedes Coupe | 5700 | 5150 | 550 |
| Davis Six Fleetaway | 2350 | 1895 | 455 | Moon 6-48, Open Models | 1985 | 1755 | 230 |
| Davis Six Man o' War | 2350 | 1895 | 455 | Moon 6-48, Enclosed Models | 2985 | 2785 | 200 |
| Davis Six Sedan | 3185 | 2595 | 590 | Moon 6-68 Touring | 2485 | 2285 | 200 |
| Davis Six Coupe | 3195 | 2595 | 600 | Nash Touring | 1195 | 1045 | 150 |
| Dixie Flyer Touring | 1345 | 1195 | 150 | Nash Sedan | 1935 | 1835 | 100 |
| Dixie Flyer Roadster | 1345 | 1195 | 150 | National Touring | 3750 | 2990 | 760 |
| Dixie Flyer Speedster | 1545 | 1395 | 150 | National Sedan | 4950 | 3990 | 960 |
| Dixie Flyer Sport Touring | 1545 | 1395 | 150 | National 7-Passenger Touring | 3990 | 4240 | *250 |
| Dixie Flyer Sedan | 1995 | 1895 | 100 | Noma, 2-pass. | 3000 | 2800 | 200 |
| Dixie Flyer Coupe | 1995 | 1895 | 100 | Noma, 4-Passenger Touring | 2650 | 2550 | 300 |
| Dorris 7-Passenger Sedan | 6690 | 7190 | *500 | Noma, 6-pass. | 3500 | 3200 | 300 |
| Durant 4 Touring | new | 590 | ... | Noma, Sedan | 4350 | 3700 | 650 |
| Durant 4 Sedan | new | 1365 | ... | Oakland Sedan | 1815 | 1725 | 90 |
| Durant Six Roadster | new | 1600 | ... | Ogren Touring | 3750 | 4250 | *500 |
| Durant Six Touring | new | 1650 | ... | Ogren Sedan | 5400 | 5500 | *100 |
| Durant Six Coupe | new | 2250 | ... | Oldsmobile 43-A Touring | 1345 | 1145 | 200 |
| Durant Six Sedan | new | 2400 | ... | Oldsmobile 43A Roadster | 1325 | 1145 | 180 |
| Earl 40 Touring | new | 1285 | ... | Oldsmobile 43-A Coupe | 1895 | 1645 | 250 |
| Elcar 6 Sedan | 2600 | 2495 | 105 | Oldsmobile 43-A Sedan | 2100 | 1845 | 255 |
| Elcar 4 Touring | 1575 | 1195 | 105 | Oldsmobile 47 Touring | 1725 | 1625 | 100 |
| Elcar 4 Sedan | 2395 | 2295 | 100 | Oldsmobile 47 Coupe | 2225 | 2185 | 40 |
| Elcar 6 Standard Touring Car | 1595 | 1345 | 250 | Oldsmobile 47 Sedan | 2425 | 2425 | ... |
| Elcar 6 Standard Sedan | 2495 | 1855 | 640 | Oldsmobile 46 Touring | 1875 | 1735 | 140 |
| Elcar 6 De Luxe Touring | new | 1595 | ... | Oldsmobile 46 Pacemaker | 1625 | 1735 | 90 |
| Elcar 6 De Luxe Sedan | new | 2495 | ... | Oldsmobile 46 Sedan | 2775 | 2635 | 140 |
| Essex Touring | 1375 | 1195 | 180 | Overland Touring | 695 | 595 | 100 |
| Essex Sedan | 2230 | 1995 | 235 | Overland Sedan | 1275 | 895 | 380 |
| Falcon (Halladay) Six Roadster | new | 1595 | ... | Packard Six Touring | 2975 | 2350 | 625 |
| Falcon Six Touring | new | 1595 | ... | Packard Six Sedan | 3975 | 3350 | 625 |
| Falcon Six Sedan | new | 2395 | ... | Packard 12 Touring | 6000 | 4850 | 1150 |
| Falcon Six Coupe | new | 2295 | ... | Packard 12 Sedan | 8450 | 6800 | 1650 |
| Falcon Six Cabriolet | new | 1795 | ... | Peerless Touring | 2990 | 2880 | 110 |
| Falcon Light Four Roadster | new | 1295 | ... | Peerless Sedan | 3950 | 3790 | 140 |
| Falcon Light Four Touring | new | 1295 | ... | Piedmont 4-30 Touring | 1270 | 970 | 300 |
| Falcon Light Four Sedan | new | 2085 | ... | Piedmont 6-40 Touring | 1495 | 1285 | 210 |
| Falcon Light Four Coupe | new | 1990 | ... | Pierce-Arrow Touring | 7500 | 6500 | 1000 |
| Falcon Light Four Cabriolet | new | 1495 | ... | Pierce-Arrow Sedan | 9000 | 8500 | 500 |
| Ferris Touring | 3350 | 2595 | 755 | Premier Touring | 4600 | 3890 | 710 |
| Ferris Sedan | 4100 | 3695 | 405 | Premier Sedan | 6100 | 5190 | 910 |
| Fiat Touring | 2575 | 1995 | 580 | R. & V. Four Touring | 2150 | 1500 | 650 |
| Fiat Sedan | 3275 | 2495 | 780 | R. & V. Four Sedan | 2950 | 2750 | 200 |
| Ford Regular Chassis | 345 | 295 | 50 | | | | |

(Continued on Next Page.)

Motoramp System Pleases

Said to Be Convenient for Owner-Driver—Combines Good Points of Elevator and Inclined Runway—Open Construction Minimizes Accident Danger Is Claim.

(By HAROLD F. BLANCHARD.)

THE good points of elevators and ramps, with the disadvantages of neither, are found in the Nelson House garage, recently opened in Poughkeepsie, N. Y. It is the first building in the country to incorporate the d'Humy Motoramp system, and the features of the building are based on the unique principles of this patented construction.

THE building is a three-story structure, approximately 100 by 100 feet, divided vertically in the center, the floors in one-half being placed half-way between the floors in the other half. By this simple modification ramps half the usual length may be used to connect the various floors a half-story apart. And these short ramps may be so arranged that they permit continuous travel up or down through the building.

Because of the fact that these ramps are half-length they are short enough to be employed as connecting passages between the main car storage aisles. As a consequence, in the average building, a

storage of two cars more per floor than if a single elevator is used. In the Nelson House garage the ramps are about seven feet wider than necessary and,



there is never any chance of getting into difficulty, much less any danger. Timid, nervous or inexperienced operators are at ease on these ramps. If cars are coming in opposite directions the drivers of the two machines see each other far enough in advance so that they can pass in the aisle.

These ramps are so short and easy to negotiate that many car owners do not realize that they are ramps. They have been so accustomed to associating the common ramp with a long, dark passage way, with a blind turn at either end, that numerous motorists who have used this new building have spoken of the ramps as inclined passage ways. That feeling of misgiving which the average motorist experiences in entering a common ramp, is entirely absent when he drives up or down the inclines found in the Nelson House garage.

License rights may be obtained from the Ramp Buildings Corporation, 115 Broad street, New York City, owner of the d-Humy Motoramp patents.



d'Humy Motoramp system will not only take up less space than an ordinary ramp, but it will actually permit the

consequently, the building does not give as high storage capacity as does the average building equipped with the d'Humy Motoramp system.

The high space economy of the system is only one of several advantages. One of the peculiarities of a building equipped with d'Humy Motoramps is that the sides of the ramps may be left open. It is not necessary to box these in, as is standard practise with common ramps. The open construction affords the operator of a motor car a long view ahead, whether in rising or descending. He can see so far in advance at all times that

(Continued from Preceding Page.)

| | | | | | | | |
|--|------|------|------|--|------|------|------|
| Reo Series A Touring | 1850 | 1650 | 200 | Studebaker Light 6 Coupe Roadster.... | 1695 | 1550 | 145 |
| Reo Series A Sedan | 2750 | 2350 | 400 | Studebaker Light 6 Sedan..... | 1995 | 1850 | 145 |
| Revere Touring | 4650 | 3850 | 800 | Studebaker Big 6 Sedan | new | 2950 | ... |
| Revere Sedan | 6500 | 4500 | 2000 | Stutz Touring | 4000 | 3350 | 650 |
| Roamer 4-75-E Touring | 3985 | 3650 | 335 | Templar Touring | 2385 | 1985 | 400 |
| Romer Roadster | 2000 | 1975 | 25 | Templar Sedan | 3185 | 2785 | 400 |
| Romer 5-Passenger Touring | 2000 | 1975 | 25 | Tulsa Six Touring | 1550 | 1445 | 105 |
| Romer 7-Passenger Touring | 2100 | 2050 | 50 | Tulsa Four Touring | 1285 | 1175 | 110 |
| Romer Coupe | 2450 | 2400 | 50 | Vellie 48 Touring | 1885 | 1585 | 300 |
| Romer Sedan | 2750 | 2700 | 50 | Vellie 48 Sedan | 2885 | 2485 | 400 |
| Saxon Touring | 1495 | 1295 | 200 | Vellie 34 Touring | 1385 | 1235 | 150 |
| Saxon Sedan | 2295 | 1995 | 300 | Vellie 34 Sedan | 2485 | 2085 | 400 |
| Sayers Touring | 1945 | 1795 | 150 | Westcott Lighter 6 Touring..... | 2290 | 1890 | 400 |
| Sayers Sedan | 3295 | 2995 | 300 | Westcott Lighter 6 Roadster..... | 2290 | 1890 | 400 |
| Scripps-Booth F-43 Touring..... | new | 1490 | ... | Westcott Lighter 6 Coupe | 3390 | 2890 | 400 |
| Scripps-Booth F-43 Sedan | new | 2375 | ... | Westcott Lighter 6 Sedan | 3390 | 2890 | 400 |
| Stephens Touring | 2065 | 1850 | 215 | Westcott Lighter 6 Sport..... | 2390 | 1990 | 400 |
| Stephens Sedan | 3100 | 2850 | 250 | Westcott Larger 6, Touring..... | 2990 | 2090 | 900 |
| Stevens-Duryea Family Touring | 8000 | 6800 | 1200 | Westcott Larger 6, Sedan..... | 4590 | 3490 | 1100 |
| Stevens-Duryea, 4-pass., Touring (Sport) | ... | 6900 | ... | Westcott Larger 6, Limousine-Sedan.... | 4690 | 3690 | 1000 |
| Stevens-Duryea Roadster | ... | 7250 | ... | Willis-St. Claire, Touring, 5-pass..... | 3200 | 2875 | 325 |
| Stevens-Duryea Vestibule Limousine | ... | 8600 | ... | Willis-St. Claire, Roadster, 4-pass..... | ... | 2875 | ... |
| Stevens-Duryea Sedan, 5-pass..... | 9500 | 9000 | 500 | Willis-St. Claire Coupe, 4-pass..... | ... | 3750 | ... |
| Stevens-Duryea Three-Quarter Limousine | ... | 9500 | ... | Willis-St. Claire, Sedan, 7-pass..... | 4700 | 4100 | 600 |
| Stevens-Duryea Coupe | ... | 9500 | ... | Willis-Knight, Touring | 1895 | 1525 | 370 |
| Stevens-Duryea Cabriolet | ... | 9500 | ... | Willis-Knight, Sedan | 2750 | 2395 | 355 |
| Stevens-Duryea Chassis | ... | 5600 | ... | | | | |
| Studebaker Light 6 Chassis | ... | 975 | ... | | | | |
| Studebaker Light 6 Roadster, 2-pass..... | 1300 | 1125 | 175 | | | | |
| Studebaker Light 6 Touring | 1335 | 1150 | 185 | | | | |

*Increase.

Note: Touring car prices are for five-passenger models where one is built, otherwise seven-passenger models are specified when there is no special designation.

How to Retain the High Finish of the Car

Careless Method of Attending to This Important Detail Causes Quick Deterioration of High Finish—Soap to Be Used Only When Absolutely Necessary

THE car, when ready to leave the factory, is in a highly finished state; all of the necessary little details have been attended to, all tests made as to the mechanical units, and every part of the body, chassis, guards and hood are carefully checked over to see that no item has been neglected which is conducive to the comfort, safety and pride of the purchaser. The customary high finish has been secured through the knowledge and experience the manufacturer has gained through numberless years, and embodies the highest skill of the painter's art. Such parts as the guards and hood are japanned and baked in large ovens which gives to these units a hard, lasting finish which usually can only be injured by scratching, marring or by other mechanical means. Acids will, however, attack this finish if the soaps are used which are often sold for car washing purposes. Pure linseed oil soap is said not to be injurious to the finish and may be freely used for removing oil or grease about the guards or chassis.

The finishing of the body, whether it is of the open or closed type, requires an entirely different method of treatment to attain that perfection we see in the finished car. Many coats of various kinds are applied to the body by the painter, each one being given sufficient time to thoroughly dry before the next one is applied. In this manner the painting of a car body, especially of the enclosed type, consumes a large amount of time and, as the work must be done carefully, the workman cannot hurry the job if he wishes the best results. Nothing but the best of materials can be used and, although this type of material represents a high price, the finished job, when properly done, more than justifies the additional expense.

The process followed by the painter may be briefly described thus: The body, as it comes from the builder, has been smoothed down with sand paper and other agents to remove all rough spots on the exterior.

The first coat applied is a filler which is similar to a priming coat and is adapted to fill all holes and low spots in the body panels. After this coat has dried thoroughly it is rubbed down with either sand paper or steel wool to present a smooth surface for the priming coat which follows. After the priming coat has dried this is also smoothed down with steel wool and the color coat applied. Each successive coat is allowed to dry thoroughly before the next is ap-

plied, in this manner the under coats are not sticky or tacky to work on. In high-class work two color coats are usually applied, but for lower-priced cars only one color coat is used. After this has had time to dry sufficiently the first coat of varnish is applied. For varnishing the car body is placed in a special drying room which may be heated to any desired temperature. In this room all possibilities of dust are removed, as any foreign substance would quickly spoil the finish if allowed to enter the drying varnish.

After each coat of varnish has dried sufficiently, it is rubbed down with either moss or steel wool according to the policy of the painter doing the work. To obtain an extreme high finish, often even to 10 varnish coats are applied to a body, each coat being rubbed down before the next is applied, with the result that the finish when completed has that extreme high gloss which is so much desired. The lasting effect of a finish of this nature is much greater than if a less number of coats are applied. But it can be just as quickly ruined by carelessness as that on the body which only receives three or four coats of varnish and color.

It is no exaggeration to state that very often from 15 to 25 operations enter into the painting of a complete car, when one considers the number of coats applied, the rubbing down operations and the various parts of the car that require painting.

Duty of Purchaser to Preserve Finish.

It should be the pride of every purchaser of a passenger car, either open or closed model, to try, with every means within his power, to retain the high finish that has been put on to his car with so much forethought and care. Carelessness in regard to this detail will surely ruin the effect of the finish and give the car an old appearance when perhaps it has only been driven a few thousand miles, when it might easily have been retained for several thousand additional miles before repainting would be necessary.

How often one will see a driver take a piece of dry waste, apply a small amount of engine oil to it and run it lightly over the varnished surface of the body, to remove dust accumulations! This is not altogether confined to the drivers of public vehicles, but is often practised by owners who do their own driving and personally care for their cars. This practice is to be condemned because, in the first place, it does not fully do the work intended, and, secondly, because an oily

scum is left on the body which gathers dust quickly, making necessary a repetition of the cleaning process very shortly. Washing the car would have been decidedly better, as it would have removed the dust, as well as other oily deposits and would not have presented the oily scum to collect further dust.

Certain drivers do not even apply the oil to the waste, but consider that, as the material is soft, it will not injure the varnished surfaces. Perhaps it will not the first time it is tried, but constant repetitions cause the dust in the waste to scratch the varnish, while continued cleaning by this method dulls the varnish, making refinishing necessary.

It hardly seems possible that there is a driver anywhere who would adopt this injurious method of cleaning his car, but a careful survey among friends will often show one or more who make this a practice rather than to have the car washed.

The use of body polishes is also to be condemned from the stand point of a regular method of cleaning the car of mud and dust. Their use is better suited to second-hand cars on which the finish is already dull and on which the owner wishes to show a bright finish for a short time. The use of oil polish for removing dust and imparting a bright finish to a highly varnished car is the height of folly as the dust will collect faster after the body has been cleaned by this method than before applying it. Continued cleaning by this method will likewise eventually ruin the high finish through the abrasive action of the dust in the cleaning cloths.

There are, however, certain polishes which have a wax content that may be used with safety for cleaning purposes, especially after a car has been washed and dried with chamols to remove all trace of water or dampness. This type of polish is applied as a paste and is rubbed off with soft cloths to give a high gloss to the finished surface. For cars that were originally given an extremely high finish or on which high-class painting jobs were later done and have turned slightly dull, polishes of this nature continue to give a finish much resembling new. The wearing qualities of the polish are good, often lasting for several days after being applied. Washing, however, removes the polish, making repeated treatments necessary.

Frequent Washing with Water.

The use of water for washing either enclosed or open passenger vehicles is advocated by practically all manufacturers as being the best method yet de-

(Continued on Page 42.)

This Luxurious
"Tourmobile"
Has All the
Comforts of
a Permanent
Residence.



It Will
Serve as Home
for a N. Y. State
Family of Six
on a 15,000-
Mile Jaunt.

SPECIALLY BUILT "CABIN CRUISER" STARTS ON LONG RUN

THE permanent address of Homer E. Dyke, a Buffalo druggist, will be "North America" when he steps on the starter and casts off for a 15,000-mile tour of the South and West in his Atterbury Cabin Cruiser.

Entirely free from railroad tickets and hotel bills, Mr. Dyke and his family of five are going to "See America First" and do it from the windows of their own travelling home.

Following the ideas of Mr. Dyke, the body was designed to give utmost travelling comfort and convenience with the absolute minimum of equipment and space. From the big pneumatic tires right through to air cushions and mattresses, comfort is always uppermost in mind.

THE outside of the body is finished in dark mahogany with gold striping. Gasoline and water tanks are hidden by panels so that the entire appearance is one of neatness and elegance. Bevelled plate glass windows adjustable to any amount of opening give complete ventilation and vision and at the same time full protection from storms. Compartments for spare tires and baggage are inside so that there is no necessity for strapping spare equipment to the outside.

Inside the walls and ceiling are finished in natural wood with varnished surface. Every piece of equipment has its place and the whole effect is orderly and home-like.

Berths are arranged lengthwise and across the front and the cushions in use during the day are used as comfortable air mattresses at night.

After dark 21-candlepower ceiling lights operating in connection with the Delco electric starting and lighting system provide plenty of light for reading and general comfort.

A complete galley or kitchen at the rear of the body is equipped for cooking real meals throughout the trip. This galley is really a special kitchen cabinet equipped with gasoline stove and running water. The running water is supplied from large tanks by air pressure and is instantly available at a neat porcelain sink. In addition to the regular stove a fireless cooker is carried so that cooking

DRIVER SHOULD KEEP A TIRE LOG.

Do you keep a tire log? It will help a lot when you go to the adjuster with your tale of woe. Use a small note book and give a separate page to each tire. Rule off five vertical columns. Label them as follows: Date put on, speedometer reading, date taken off, speedometer reading, mileage. Make the partial totals in the last column and add any other information necessary, such as kind of weather, etc.

may be done with a minimum of effort and incidentally the least possible amount of fuel.

The perishable food is carried in a built in refrigerator of capacity sufficient for several days running where ice may not be available.

While the body is designed to carry the entire family both day and night, a large tent is stowed under one of the berths.

The tent is so designed that it may be attached to the body, thus giving the tourists the advantages of outdoor sleeping.

Trap doors in the floor and lockers around the sides of the ceiling give ample storage space for supplies and duffie.

The outfit is mounted on a standard 1½-ton Atterbury chassis having a speed of 22 miles an hour and a total weight of 7700 pounds.

Particular attention has been devoted to eliminating noise. The body is rigid and free from squeaks, while the chassis with a latest type Continental motor and Timken worm-drive axle, is remarkably free from vibration and gear noises are entirely lacking.

The combination of large pneumatic tires with long springs, 144-inch wheelbase and comfortable air cushions for seats and backs gives a degree of riding comfort equal to that of the finest type of conventional passenger car.

The owner of this unusual type of motor bungalow has spent much thought in planning it and those who have been so fortunate as to have had the opportunity to inspect it at close range say that it is the epitome of comfort.

Due regard was paid to the principle of spring suspension with relation to the weight of the truck and body and the result obtained has been unusually good, it is said.

Mr. Dyke has no definite plans for his trip, but will go wherever fancy dictates and will probably be away several weeks.

Civilization and the Wheel

(By THEO. H. PRICE.)

I BOUGHT my first automobile in 1903, and have ever since been an enthusiast in regard to the possibilities of motor transportation. It is the latest application of the great invention of the wheel. Few of us think of the wheel as an invention. We have become so accustomed to its use that it seems to us like the atmosphere, the right to which is a natural one conferred to us at birth and continuing until we are dead.

THE wheel is, nevertheless, an invention and, although it is prehistoric, there is conclusive evidence that at one stage in his development man was unacquainted with a device which is gradually enabling us to annihilate space and become almost ubiquitous.

In Ezekiel's wonderful prophecy of what is by some supposed to be the millenium, I find a description of the completely motorized future in the following verses:

"And when the living creatures went, the wheels went by them: and when the living creatures were lifted up from the earth, the wheels were lifted up.

"Whithersoever the spirit was to go, they went, thither was their spirit to go; and the wheels were lifted up over against them: for the spirit of the living creature was in the wheels."

To one who stands on Michigan avenue in Chicago or Woodward avenue in Detroit, the period of which the Hebrew prophet wrote would ap-

pear to be almost here for verily the spirit of the living creature seems to be in the wheels of the automobile today and whithersoever the spirit of the motorist moves him to go, thither doth he direct his machine.

With the invention of the wheel, man for the first time ceased to be a completely localized being whose radius of movement was limited to the distance he could walk or run. With the introduction of the wheel it became possible for him to traverse long distances and in both mechanics and transportation almost everything that has been accomplished, including even the steam engine and the electric dynamo, involves the use of the wheel. In tracing the development of the wheel and its complementary axle we are therefore tracing the development of a very important factor in civilization, namely the art or science of transportation, and the advance of men in their knowledge of each other, in culture and in the humanities, will be found to be very closely related to the ability to travel long distances which they acquired by the application of the wheel.

Although the invention of the wheelbarrow is attributed to Leonardo da Vinci, two-wheeled vehicles fitted with discs cut from the trunks of large-sized trees seem to have been in use from prehistoric times, but the wheel, as we know it, with a hub and its complementary spokes and felloes, did not come into use until the carpenter or joiner made his appearance and the specialists in the manufacture of wheels that we call wheelwrights were developed.

From that time on men have been carried wherever they wanted to go on

wheels that were attached to vehicles drawn by animals or propelled by power, or in steamers and aeroplanes whose motive power is derived from engines that involve the use of the wheel and are propelled by paddle wheels or screws that are essentially wheels.

The Day of the Stage Coach.

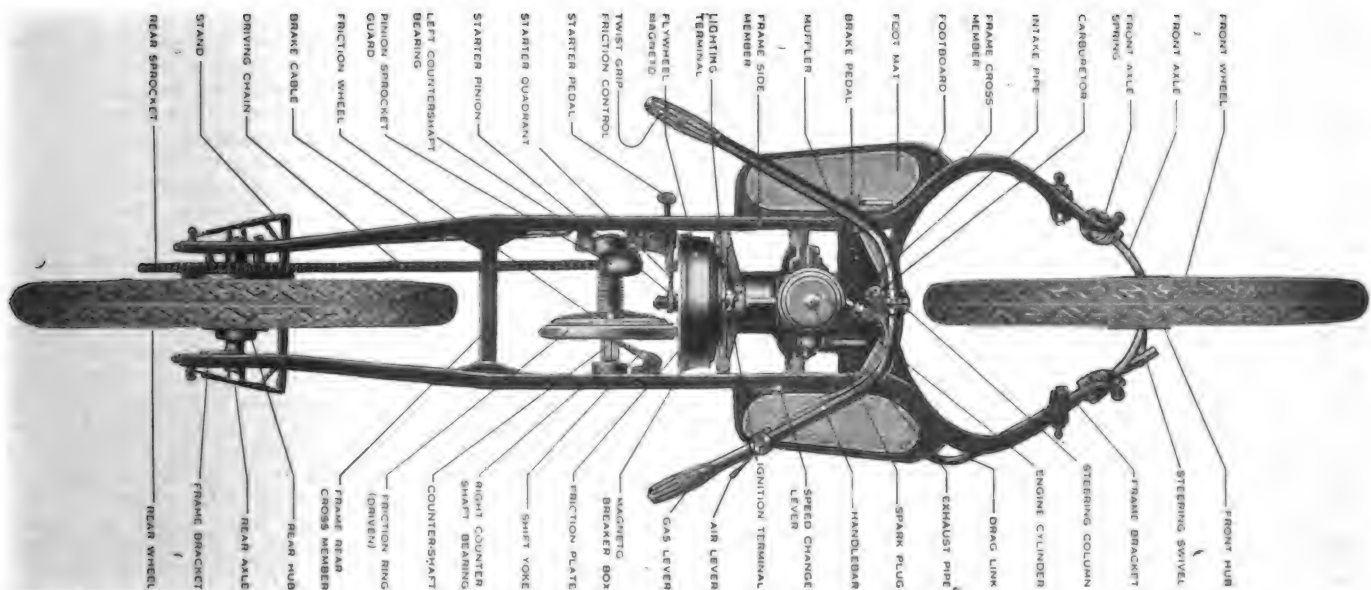
When our grandfathers had reached the stage at which they discovered it was possible to travel continuously in stage coaches by providing them with relays of horses every 10 or 15 miles, the building of post roads over which these vehicles could move with speed became, as many of you know, a national question. And just before the locomotive and the railroad commenced to be a factor in our national development Congress had made an appropriation for the construction of two such roads, one running west from Boston and another from Philadelphia. Parts of the post roads thus constructed still survive and some of you have no doubt travelled over them.

If at that time the gasoline engine had been invented, I think it is highly probable that we should have had no railroads, for if it had been possible to travel over a post road at an average speed of 25 miles an hour the railroad would have had but little chance in competition with a means of transportation which made it possible for the traveller to go directly from his home to his destination and to ship goods from the factory door to the shop of the distributor.

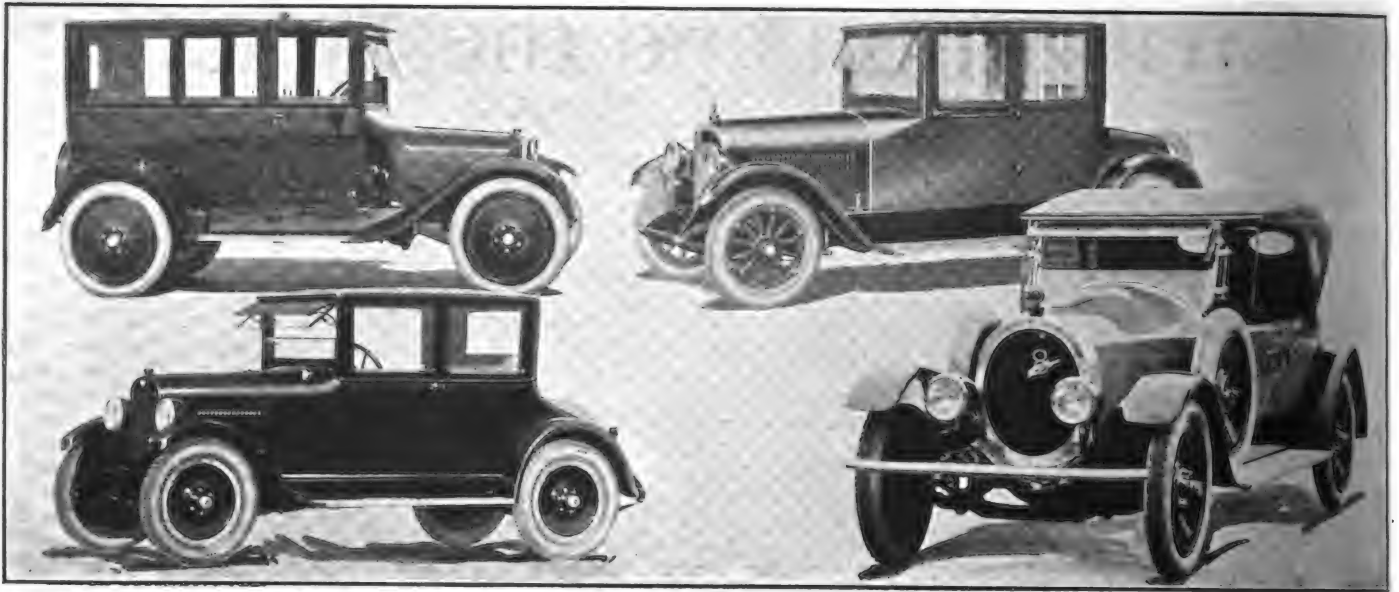
This is a condition to which we are rapidly reverting, for unless I am much mistaken the automobile now carries more passengers than the railroads and will in time carry more freight than is now hauled by the steam locomotives.

(Continued on Page 41.)

The Ner-A-Car; "An Innovation That Fills a Need".



This "Automobile on Two Wheels" is Highly Praised by Those Who Have Had Opportunity to Test It—it is to Be Shown at the New York-Chicago Shows and Will Undoubtedly Attract a Lot of Well-Deserved Attention.



That the Industry Has Fully Recovered from the War Is Shown by the Number of Cars Exhibited—Upper Left, Dodge Sedan; Lower Left, Maxwell Coupe; Upper Right, R. & V. Knight Model J; Lower Right, Apperson Beverly Tourster, Tourquipt.

(Continued from Page 8.)

| Exhibitor | N.Y. | Chi. |
|--|------|------|
| Automotive Gear Works, Atlanta, Ga. | • | • |
| Automotive Parts Mfg. Co., New York | • | • |
| B. G. Corp., New York | • | • |
| Badger Mfg. Corp., Milwaukee, Wis. | • | • |
| Alfred E. Baker & Co., Chicago, Ill. | • | • |
| Barnes Foundry Co., Jersey City, N. J. | • | • |
| Wallace Barnes Co., Bristol, Conn. | • | • |
| Bassick Mfg. Co., Chicago, Ill. | • | • |
| Becker Bros., Chicago, Ill. | • | • |
| Beneke & Kropf Mfg. Co., Chicago, Ill. | • | • |
| Benzer Corp., Brooklyn, N. Y. | • | • |
| Biflex Products Co., Waukegan, Ill. | • | • |
| C. G. Bird, Chicago, Ill. | • | • |
| Blackledge Mfg. Co., Chicago, Ill. | • | • |
| Blue Ribbon Body Co., Bridgeport, Conn. | • | • |
| Borg & Beck Co., Chicago, Ill. | • | • |
| Bowen Products Corp., Auburn, N. Y. | • | • |
| J. D. Bridgers Co., Florence, S. C. | • | • |
| Brown-Lipe Gear Co., Syracuse, N. Y. | • | • |
| Buda Co., Harvey, Ill. | • | • |
| Edward G. Budd Mfg. Co., Philadelphia, Pa. | • | • |
| Budd Wheel Corp., Philadelphia, Pa. | • | • |
| Buell Mfg. Co., Chicago, Ill. | • | • |
| Bunnell & Co., Chicago, Ill. | • | • |
| Burpee-Johnson Co., Indianapolis, Ind. | • | • |
| Byrne, Kingston & Co., Kokomo, Ind. | • | • |
| C. G. Spring Co., Kalamazoo, Mich. | • | • |
| A. S. Campbell Co., E. Boston, Mass. | • | • |
| Carr Fastener Co., Cambridge, Mass. | • | • |
| Carrm Auto Body Co., New York | • | • |
| Casey Hudson Co., Chicago, Ill. | • | • |
| Champion Ignition Co., Flint, Mich. | • | • |
| Champion Mfg. Co., Chicago, Ill. | • | • |
| Champion Pneumatic Machinery Co., Chicago, Ill. | • | • |
| Chicago Tool & Kit Mfg. Co., Chicago, Ill. | • | • |
| Clark Equipment Co., Buchanan, Mich. | • | • |
| Clark-Turner Piston Co., Los Angeles, Cal. | • | • |
| Coffield-Tire Protector Co., New York | • | • |
| Collins Puncture Proof Tube Co., Hackensack, N. J. | • | • |
| Columbia Axle Co., Cleveland, O. | • | • |
| K. S. Conrad Co., Inc., Greenville, S. C. | • | • |
| Continental Motors Corp., Detroit, Mich. | • | • |
| Cozy Baby Carriage Co., Minneapolis, Minn. | • | • |
| C. Cowles & Co., New Haven, Conn. | • | • |
| Cox Brass Mfg. Co., Albany, N. Y. | • | • |
| E. de L. Engineering Works, New York | • | • |
| Damon Mfg. Co., Chicago, Ill. | • | • |
| Dayton Steel Foundry Co., Dayton, O. | • | • |
| A. J. Detlaft Co., Detroit, Mich. | • | • |
| Detroit Pressed Steel Co., Detroit, Mich. | • | • |
| Dextra Sales Co., Detroit, Mich. | • | • |
| Doehler Die Casting Co., Brooklyn, N. Y. | • | • |
| Double Safety Signal Co., Chicago, Ill. | • | • |
| Double Seal Ring Co., New York | • | • |
| Doughty Mfg. Co., New York | • | • |
| George W. Dover, Inc., Providence, R. I. | • | • |
| Duplex Signal Co., Inc., New York | • | • |
| E. A. Laboratories, Inc., Brooklyn, N. Y. | • | • |
| Eberhard Mfg. Co., Cleveland, O. | • | • |
| Eclipse Machine Co., Elmira, N. Y. | • | • |
| Elgin Rubber Ace Co., Elgin, Ill. | • | • |
| English & Mersick Co., New Haven, Conn. | • | • |
| L. B. Erwin Co., Chicago, Ill. | • | • |
| Eureka Auto Lock Co., Chicago, Ill. | • | • |
| Fan Flame Spark Plug Co., Inc., Yonkers | • | • |

as well as the New York show. They announce that their trip is for business as well as for pleasure.

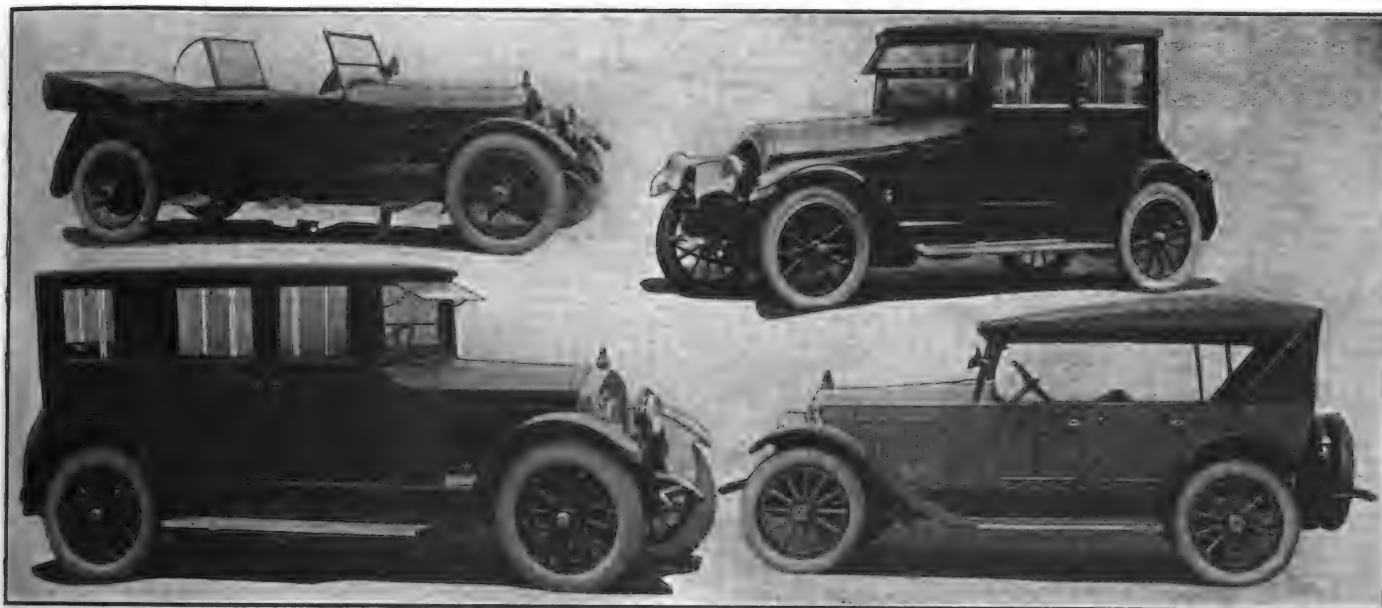
George Hull, who represents in Paris the publicity department of the New York section of the shows, writes that the interest in the exposition in France is wonderful. French manufacturers are planning, in many cases, to visit this country personally, or to send representatives. One reason for the big interest in American cars in France is that the makes are so well represented in that country, and it is also possible to obtain spare parts and service for the popular American cars not only in Paris, but also in many small French towns. Another factor is that the French manufacturers are becoming greatly interested in studying American quantity production methods.

A representative of the National Automobile show, while on a recent visit to Canada, received assurances that the Dominion automobile trade would be well represented, both at New York and Chicago. Men interested in the motor car and its affiliated industries in Ottawa, Montreal and Toronto expect the shows to result in wonderful business and they want to be on hand for the turn of the tide. Another reason for a big Canadian delegation coming to New York is that the Vauxhall car, manufactured in Toronto, is to be shown at the Grand Central Palace. This is the first appearance of the car at an American show.

Elaborate Decorative Scheme.

Although the cars are par excellence things of beauty of themselves in their rich and varied color schemes of finish and luxuriousness of fittings, not a little of the appeal of the big annual shows is due to the elaborate and harmonious settings which form the background. The decorative motif this season is fully in keeping with what might be expected from the artistic successes of former years.

Complete details of the decorative scheme to be used at Grand Central Palace have been released by M. A. Singer,



Beautiful Lines Characterize the Offerings for the Coming Year—Here Are: Upper Left, Roamer Sport Model; Lower Left, New Series Handley-Knight Sedan; Upper Right, Franklin Brougham; Lower Right, Packard Single-Six, Specially Equipped.

decorator-general of the display. It has been decided to embellish the purple background with additional gold trimmings. This purple and gold effect will be used on the main floor and grand stair case only; the second and fourth floors being treated with a light blue effect, while the third floor calls for light green.

On the main floor there are eight piers, four engaged pillars and 16 group pillars to be considered. The piers will be draped with royal purple velour first, then hung with gold tassels, while huge gold emblems will be placed near the top both back and front. Above the draperies will be willow flower baskets filled with smilax and other blooms. The pillars will be treated in practically the same manner, except that there will be no golden emblems, while the windows on the four sides of the building will be curtained with royal purple and gold, with a panel in the center on which will be the name of the exhibitor occupying the space.

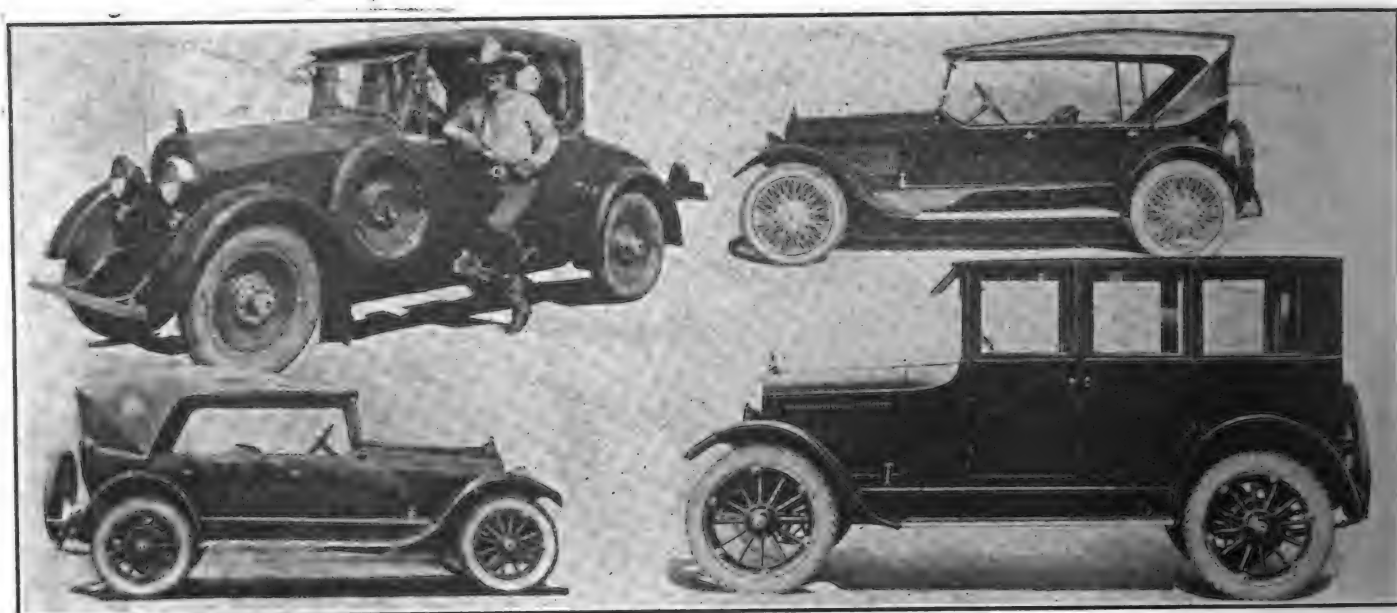
The broad stairway and lobby at the entrance will conform with the purple and gold color scheme, aided by a profusion of smilax, ferns, palms and other foliage. The balustrades and big panels at each side of the entrance will also be beautifully draped, the rich purple taking the place of the scenic effects of previous years.

On the upper floors there are more than 200 pillars, and hundreds of windows to be treated. The light blue selected for the second and fourth floors will offer a very pretty setting, more subdued than the rich effect on the main floor, but decidedly harmonious when offset by the floral decorations. On the third floor light green has been selected to give a little color change, the idea of the design being to rest the eye by giving a variety, rather than to have the same setting on the four floors.

In fact, purple and gold will be the National Automobile show colors in New York this year, and with practically 50,000 out of town visitors here for the exposition it is expected that hotels, thea-

Exhibitor

| | |
|---|-----------|
| Wm. M. Farans, New York..... | N.Y. Chi. |
| J. H. Faw Co., New York..... | • |
| Fire Gun Mfg. Co., Inc., New York..... | • |
| Ferodo, care Aldred & Co., New York..... | • |
| Fisher-Sweeney Bronze Co., Hoboken, N. J..... | • |
| Folberth Auto Spec. Co., Cleveland, O..... | • |
| Forshay Bros., New York..... | • |
| Fracto, Inc., Boston, Mass..... | • |
| Fulton Co., Knoxville, Tenn..... | • |
| Gabriel Mfg. Co., Cleveland, O..... | • |
| Gahm-McCormick Co., Streator, Ill..... | • |
| Gates Mfg. Co., Indianapolis, Ind..... | • |
| Gemco Mfg. Co., Milwaukee, Wis..... | • |
| General Aluminum & Brass Mfg. Co., Detroit, Mich..... | • |
| General Electric Co., Schenectady, N. Y..... | • |
| General Safety Signal Co., New York..... | • |
| Gerke Sales Co., New York..... | • |
| Giant Grip Mfg. Co., Oshkosh, Wis..... | • |
| Gill Mfg. Co., Chicago, Ill..... | • |
| Gits Bros. Mfg. Co., Chicago, Ill..... | • |
| Globe Mfg. Co., Battle Creek, Mich..... | • |
| Grand Rapids Brass Co., Grand Rapids, Mich..... | • |
| Graynie Corp., Chicago, Ill..... | • |
| Guarantee Liquid Measure Co., Rochester, Pa..... | • |
| C. M. Hall Lamp Co., Kenosha, Wis..... | • |
| L. P. Halladay Co., Decatur, Ill..... | • |
| Hartford Automotive Parts Co., Hartford, Conn..... | • |
| Hartford Battery Mfg. Co., Milldale, Conn..... | • |
| Edward V. Hartford, Inc., New York..... | • |
| Hartland Co., New York..... | • |
| Harvey Rim & Wheel Co., Buffalo, N. Y..... | • |
| Robert H. Hassler, Inc., Indianapolis, Ind..... | • |
| Hayes Mfg. Co., Detroit, Mich..... | • |
| Heald Machine Co., Worcester, Mass..... | • |
| R. M. Hollingshead Co., Camden, N. J..... | • |
| Ernest Holmes Co., Chattanooga, Tenn..... | • |
| Geo. L. Holmes, New York..... | • |
| Holophane Glass Co., Inc., New York..... | • |
| Houdaille Co., Buffalo, N. Y..... | • |
| Houpt Machine Co., Long Island City, N. Y..... | • |
| Hugro Mfg. Co., Chicago, Ill..... | • |
| Imperial Brass Mfg. Co., Chicago, Ill..... | • |
| Indiana Piston Ring Co., Hagerstown, Ind..... | • |
| Jefferson Forge Products Co., Detroit, Mich..... | • |
| Jon-Con Tire Protector Co., Philadelphia, Pa..... | • |
| Johnson Automobile Lock Co., St. Louis, Mo..... | • |
| Julian Pump & Mfg. Co., Jamestown, N. Y..... | • |
| K-W Ignition Co., Cleveland, O..... | • |
| Kant-Rust Products Corp., Rahway, N. J..... | • |
| Kant-Skore Piston Co., Cincinnati, O..... | • |
| I. Kellerman, New York..... | • |
| Kelso Mfg. Co., Trenton, N. J..... | • |
| Atwater Kent Mfg. Co., Philadelphia, Pa..... | • |
| Kokomo Electric Co., Kokomo, Ind..... | • |
| Kollmorgen Optical Corp., Brooklyn, N. Y..... | • |
| Kraeuter & Co., Inc., Newark, N. J..... | • |
| La-Lo Chemical Co., Inc., Providence, R. I..... | • |
| Landis Tool Co., Waynesboro, Pa..... | • |
| Lane Bros. Co., Poughkeepsie, N. Y..... | • |
| Geo. E. La Vietas Co., New Haven, Conn..... | • |
| L. Lawrence & Co., Newark, N. J..... | • |
| Geo. W. LeCompte Co., Newark, N. J..... | • |
| Leland Lock Co., Detroit, Mich..... | • |
| Light Mfg. & Foundry Co., Pottstown, Pa..... | • |
| Link Belt Co., Indianapolis, Ind..... | • |



Another Group of Thoroughbreds—Upper Left, Leach Four-Passenger Coupe, Model 8-80; Lower Left, Stephens Sallient Six Touring Model 84; Upper Right, Hanson Model 60, Four-Passenger Sport Car; Lower Right, Gardner Model S Four Door Sedan.

Exhibitor

| | |
|---|-----------|
| David Layton's Sons Co., Philadelphia, Pa. | N.Y. Chi. |
| Lyons Level and Tool Co., New Haven, Conn. | . |
| McQuay-Norris Mfg. Co., St. Louis, Mo. | . |
| Macbeth-Evans Glass Co., New York. | . |
| John L. Madsen, New York. | . |
| Manley Mfg. Co., York, Pa. | . |
| Paul M. Marko & Co., Brooklyn, N. Y. | . |
| Martin Motor Co., Springfield, Mass. | . |
| S. W. Merritt Co., Inc., New York. | . |
| Metal Stamping Co., Long Island City, N. Y. | . |
| Michigan State Auto School, Detroit, Mich. | . |
| Midwest Engine Co., Indianapolis, Ind. | . |
| Miller Auto Supply Co., New York. | . |
| Millers Falls Co., New York. | . |
| Milwaukee Tank Works, Milwaukee, Wis. | . |
| Monarch Metal Products Co., St. Louis, Mo. | . |
| Stephen V. Morrin, New York. | . |
| Morse Chain Co., Ithaca, N. Y. | . |
| Moto-Meter Co., Long Island City, N. Y. | . |
| Mullins Body Corp., Salem, O. | . |
| Naperville Machine Co., Inc., Naperville, Ill. | . |
| National Seal Co., Brooklyn, N. Y. | . |
| National Springs Co., New Castle, Ind. | . |
| Ner-A-Car Corp., Syracuse, N. Y. | . |
| Never Break Products Co., Inc., Bangor, Pa. | . |
| New York Coil Co., New York. | . |
| No-Leak-O Piston Ring Co., Baltimore, Md. | . |
| Norton Co., Worcester, Mass. | . |
| P. & F. Auto Supply Co., Inc., New York. | . |
| Packard Engineering Co., Cleveland, O. | . |
| Pantasote Co., New York. | . |
| Parko Mfg. Co., Inc., Rochester, N. Y. | . |
| Perfection Heater & Mfg. Co., Cleveland, O. | . |
| Philadelphia Storage Battery Co., Philadelphia, Pa. | . |
| Philbrin Corp., Kennett Square, Pa. | . |
| Pines Mfg. Co., Chicago, Ill. | . |
| Porter Elec. Carburetor, Inc., New York. | . |
| Wm. E. Pratt Mfg. Co., Chicago, Ill. | . |
| Preferred Utilities Co., Inc., New York. | . |
| Pro-Mo-Tor Fabricating Corp., New York. | . |
| Protex Signal Co., Cleveland, O. | . |
| W. E. Pruden Hardware Co., New York. | . |
| Pyrene Mfg. Co., Inc., New York. | . |
| Rajo Motor Co., Racine, Wis. | . |
| Recording Devices Co., Dayton, O. | . |
| Rees Mfg. Co., Pittsburgh, Pa. | . |
| Rex Mfg. Co., Connersville, Ind. | . |
| Rimtec Lubricator Co., Inc., Boston, Mass. | . |
| Geo. H. Rives Mfg. Co., Inc., Brooklyn, N. Y. | . |
| Ryser Machine Works, Chicago, Ill. | . |
| Safetee Glass Co., Philadelphia, Pa. | . |
| Safetrom Mfg. Co., Chicago, Ill. | . |
| Schapp Co., Brooklyn, N. Y. | . |
| A. Schraders Son, Inc., Brooklyn, N. Y. | . |
| Sedgwick Sales Co., New York. | . |
| Self Seating Valve Co., Chicago, Ill. | . |
| Sewell Cushion Wheel Co., Detroit, Mich. | . |
| H. B. Shontz Co., Inc., New York. | . |
| H. A. Shunk, Inc., New York. | . |
| Simplex Corp., Chicago, Ill. | . |
| Sinclair Millitor Corp., New York. | . |
| Fred A. Smith, New Rochelle, N. Y. | . |
| Jos. N. Smith & Co., Detroit, Mich. | . |
| F. L. Smithe Machine Co., New York. | . |
| Snap Chain Co., Chicago, Ill. | . |

ters, department stores and automobile and automobile accessory firms will display the hues to every advantage, both before and during the period of the motor car display.

Many Meetings and Conventions.

Another feature of show week and one that will undoubtedly interest the trade, is the great number of meetings and conventions that will take place during the period. Already these total more than 100 and the list is not yet completed. One of the big events of the week will be the get-together dinner of the "Old Timers." This organization includes men who have been connected with the automobile industry since its infancy, and though the members are widely scattered in different parts of the country they will be in New York City strong during exposition week. The annual business session and election of officers of the National Automobile Chamber of Commerce will also be held during New York show week.

Details of Pioneer Car Feature.

Referring again to the plan of the show management to bring to light the oldest automobile of standard American make still in running condition, the details are as follows:

Candidates are required to send details of the make of car; the year of manufacture; the manufacturer's number, if possible; an estimate of the number of miles the car has run; what changes, if any, have been made, and as nearly as possible the date and distance of its last run, with a photograph of the car, to S. A. Miles, general manager, National Automobile shows, 366 Madison avenue, New York City, on or before Jan. 9, 1922.

The conditions under which the old car owners can enter their automobiles follow: It must be the property of an individual who is not a manufacturer; must have been built prior to 1907; must still be of some practical use; must have been in its day a standard model of one of the exhibitors at this season's show; must be driven under its own power from point of delivery in Chicago to the Coliseum.

and remain on exhibition there during the week of the exposition. The show management will pay for the transportation of the owner of the car and the car itself, from any part of the United States to Chicago and return.

The winner will be selected by a committee of three of which Robert A. Brannigan, head of the Patents Department of the National Chamber of Commerce will be chairman.

Prospective competitors will see by the following list the cars that are eligible, the makes being those exhibiting at either the New York and Chicago expositions or both.

Ambassador, Anderson, Apperson, Auburn, Bournonville, Buick, Cadillac, Case, Chalmers, Chandler, Chevrolet, Cleveland, Cole, Columbia, Crow-Elkhart, Davis, Detroit Electric, Dixie Flyer, Dodge Brothers, Dorris, Dort, duPont, Durant, Earl, Elcar, Elgin, Essex, Franklin, Gardner, Goodspeed, Grant, Handley-Knight, Hanson, Hatfield, Haynes, H. C. S., Holmes, Hudson, Hupmobile, Itala, Jordan, Kelsey, King, Kissel, Kline Kar, Lafayette, Leach-Biltwell, Lexington, Liberty, Lincoln, Locomobile, McFarlan, Malbohm, Marmon, Maxwell, Mercer, Milburn, Mitchell, Moon, Nash, National, Noma, Oakland, Oldsmobile, Overland, Packard, Paige, Paterson, Peerless, Pierce-Arrow, Pilot, Premier, Rauch-Lang, R. & V. Knight, Reo, Rickenbacker, Roamer, Saxon, Sayers, Standard, Stanley, Stearns-Knight, Stephens, Stevens-Duryea, Studebaker, Stutz, Temp-lar, Vauxhall, Velle, Westcott, Wills St. Claire and Willys-Knight.

Chicago Show Jan. 28-Feb. 4.

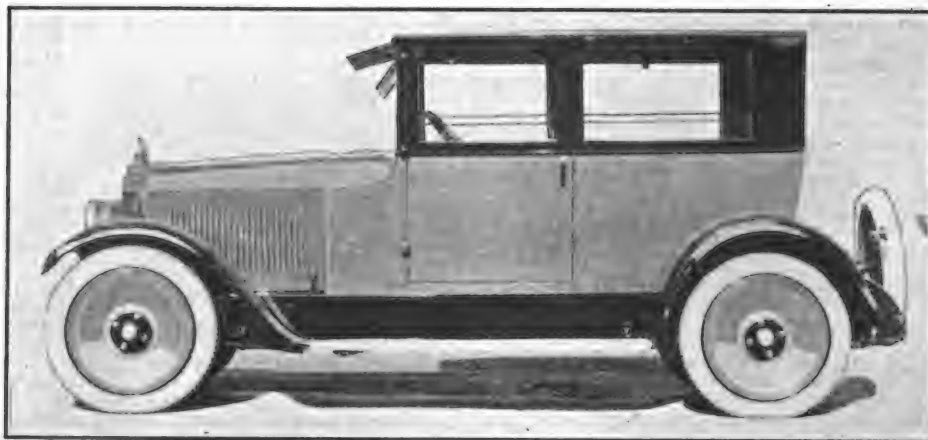
The Chicago half of the National show will be held in the Coliseum and Armory, Jan. 28-Feb. 4. Up to date 80 makes of cars are scheduled to be shown there, including those to be seen at New York, a complete list of which is given elsewhere in this issue, with the exception of the du Pont, Kline Kar, Ambassador, Noma, Leach-Biltwell, Hatfield, Bournonville, Essex, Rickenbacker, Kelsey, Itala and Vauxhall. Practically the same list of accessories, equipment, etc., will be displayed again at Chicago. It is highly probable, however, as has been the case in previous years, that several additional makes of cars may be listed at Chicago in the last days before that show, and a few additions to and changes in the accessories branch may be expected.

Show Committee.

The show committee this year is composed of H. M. Jewett, chairman; F. C. Chandler and J. Walter Drake. S. A. Miles is the general manager of both exhibitions.

Body Builders' Show.

A feature of this year's show week at New York will be the annual Automobile Body Builders' show, which will be held in the 12th Regiment Armory. This will give car manufacturers and their agents, automotive engineers, purchasing agents, designers, transportation managers, municipal executives and all others vitally interested in the manufacture or use of motor vehicles an opportunity to see the most complete assortment of body types ever assembled under one roof. Beside the passenger bodies shown both in finished condition and "in the white," there will be a full line of commercial vehicles, including dumping bodies, light and heavy panel bodies and omnibus bodies.



This Moon 6-48 Will Prove Popular with the Younger Set.

Exhibitor

| | N.Y. Chi. |
|---|-----------|
| South Bend Lathe Works, South Bend, Ind. | |
| Sparks-Withington Co., Jackson, Mich. | |
| Splitdorf Electrical Co., Newark, N. J. | |
| Standard Auto Parts Co. of America, Newark, N. J. | |
| John T. Stanley Co., Inc., New York | |
| Steel Spring Piston Ring Co., Brooklyn, N. Y. | |
| Stewart-Warner Speedometer Corp., Chicago | |
| Stokes Engineering Co., Inc., Good Ground, Long Island, N. Y. | |
| Stromberg Motor Devices Co., Chicago, Ill. | |
| Sun Co., Philadelphia, Pa. | |
| Sunderman Corp., Newburg, N. Y. | |
| Superior Lamp Mfg. Co., New York | |
| Tanners' Council of the U. S. A., Upholstery Division, New York | |
| Timken-Detroit Axle Co., Detroit, Mich. | |
| Tirometer Valve Corp. of America, Charleston, W. Va. | |
| Tonneau Shield Co., New York | |
| Trexler Co., Philadelphia, Pa. | |
| Trindl Co., Chicago, Ill. | |
| Triple Action Spring Co. of N. Y., Inc., New York | |
| U. & J. Carburetor Co., Chicago, Ill. | |
| Union Agencies Co., Chicago, Ill. | |
| U. S. Axle Co., Pottstown, Pa. | |
| U. S. Compression Inner Tube Co., Tulsa, Okla. | |
| U. S. E. Corp., New York | |
| Utica Compressor Co., Inc., Utica, N. Y. | |
| Vacuum Oil Co., New York | |
| Van Kerr Co., New York | |
| Van Norman Machine Tool Co., Springfield, Mass. | |
| Veeder Mfg. Co., Hartford, Conn. | |
| Vibration Specialty Co., Philadelphia, Pa. | |
| Viktry Mfg. Co., Milwaukee, Wis. | |
| Walker Mfg. Co., Racine, Wis. | |
| Waltham Watch Co., Waltham, Mass. | |
| Warner Patterson Co., Chicago, Ill. | |
| John Warren Watson Co., Philadelphia, Pa. | |
| Waukesha Motor Co., Waukesha, Wis. | |
| Weaver Mfg. Co., Springfield, Ill. | |
| Joseph Weidenhoff, Chicago, Ill. | |
| Weldley Motors Co., Indianapolis, Ind. | |
| Weldo Patch Mfg. Co., New York | |
| Wellman-Seaver-Morgan Co., Akron, O. | |
| Westinghouse Lamp Co., New York | |
| Weston Electrical Instrument Co., Newark, N. J. | |
| Wheeler-Schebler Carburetor Co., Indianapolis, Ind. | |
| White Products Co., Chicago, Ill. | |
| S. S. White Dental Mfg. Co., New York | |
| Whitney Mfg. Co., Hartford, Conn. | |
| Wildenberg Bros., New York | |
| K. R. Wilson, Buffalo, N. Y. | |



Mercer Design and Quality Characterize This Fine Job.

Exhibitor

Winterknight Equipment Co., Philadelphia, Pa. N.Y. Chi.
 Wire Wheel Corp. of America, Buffalo, N. Y.
 Wisconsin Top Co., Inc., Racine, Wis.
 Witherbee Storage Battery Co., Inc., New York
 F. Wolkow & Sons, Louisville, Ky.
 World Metal Products Corp., Richmond Hill, N. Y.
 Wyman-Gordon Co., Worcester, Mass.
 Zenith Carburetor Co., Detroit, Mich.
 B. F. Zimmerman Mfg. Co., Inc., New Haven, Conn.

(Continued from Page 12.)

Belden; Sales Mgr., A. C. Barber; Research Engineer, A. J. Baker. N. Y. Show Space, A-12; Chicago, C-3.

Received Too Late to Classify.

American Chain Co., Inc.—Pres., W. B. Laschar; Vice Pres., W. T. Morris; Sec., W. M. Wheeler; Treas., W. F. Wheeler; Engineer, F. H. Dechant; Sales Mgr., A. P. Van Schaick; Production Mgr., W. F. Wheeler; Adv. Mgr., J. O. Laschar; Representatives, E. G. Carbrey, D. L. Benton, W. F. Cotter, J. H. Brooks, F. E. Sparks, C. H. Marshall, J. N. Lee, G. M. Kutz. N. Y. Show Spaces, 391 and 392; Chicago, 23 and 24.

American Non-Ferrous Metals Corp.—Pres., P. R. Grant; Vice Pres., Geo. L. Snediker; Acting Secretary, Chas. H. Davis; Treas., Adrian Vermeule; Engineer, P. R. Grant; Asst. Engineer, H. D. Fowler. N. Y. Show Space, D-93.

Barley Motor Car Co.—Pres., A. C. Barley; Sec., G. B. Hopkins; Treas., C. E. Stephenson; Engineer, B. Read; Sales Mgr., L. R. Fulton; Adv. Mgr., L. E. Burridge. N. Y. Show Space, B-3; Chicago, B-2, First Regiment Armory.

Bilflex Products Co.—Pres., W. G. Pancoast; Vice Pres., W. J. Grotenhuis; Treas., M. B. Ericson; Sales Mgr., W. E. Ericson; Representatives, J. E. Redman, W. C. Scott, M. B. Ericson, W. G. Pancoast, F. D. Sweet, R. F. Peterson, G. G. Bremer, W. J. Grotenhuis. N. Y. Show Spaces, D-33 and 34; Chicago, 163 to 166, inclusive.

Buda Co.—Pres., L. M. Viles; Vice Pres., F. E. Place; Treas., H. M. Sloan; Engineer, R. J. Broege; Sales Mgr., J. P. Mahoney; Production Mgr., E. D. Conant. Chicago Show Spaces, 33 and 34.

Budd Wheel Co.—Pres., Edward G. Budd; Vice Pres., Hugh L. Adams; Sec., Paul Pleiss; Sales Mgr., W. J. Bryan; Service Dept., E. Ingham. N. Y. Show Spaces, D-159 and 160; Chicago, 43.

Cadillac Motor Car Co.—Engineer, E. W. Seaholm; Sales Mgr., L. McNaughton; Adv. Mgr., V. E. Burnett.

A. S. Campbell Co.—Pres., A. S. Campbell; N. Y. Representative, S. A. Howard; Representatives, L. H. Emery, G. C. Austin, J. E. Nihan; Sales and Adv. Mgr., J. G. Campazzie. N. Y. Show Space, D-24; Chicago, 61, Coliseum Annex, Basement.

Carr Fastener Co.—N. Y. Show Space, 224; Chicago, 99.

Chevrolet Motor Co.—General Sales Mgr., Colin Campbell; Adv. Mgr., J. H. Newmark; Chicago Sales Mgr., L. K. Cooper.

Clark-Turner Piston Co.—Asst. to the Secretary, E. P. Rawlinson; Special Factory Representative, H. E. Goodenow. N. Y. Show Space, D-25; Chicago, 36.

Columbia Motors Co.—Pres., J. G. Bayerline; Vice Pres., Walter Daly, Wm. E. Metzger; Sec. and Treas., A. T. O'Connor; Engineer, Ray Long; Commercial Mgr., John T. Bowers; Production Mgr., T. A. Bollinger; Adv. Mgr., W. C. Hunt. N. Y. Headquarters, Commodore Hotel; Chicago, La Salle Hotel.

Dayton Steel Foundry Co.—Pres., Geo. Walther; Production Mgr., Chas. F. Baker. N. Y. Show Space, C-70; Chicago, 59.

L. B. Erwin & Co.—Pres., Lawrence B. Erwin; Vice Pres., J. G. Erwin; Engineer, P. Dalrymple; Production Mgr., H. V. Glos; Chicago Show Space, 30, Gallery Floor, First Regiment Armory.

Hartland Co.—Representatives, S. W. Hartley, S. S. McClelland, C. H. Loeb. N. Y. Show Space, D-189; Chicago, 23.

Leach-Biltwell Motor Car Co.—Pres., M. A. Leach; Sales Mgr., Roy D. Heartz. N. Y. Show Spaces, D-1, 2 and 3; Chicago Headquarters, Congress Hotel.

Whitney Mfg. Co.—Pres., C. E. Whitney; Engineer, W. J. Belchre; Sales Mgr., C. E. Wertman; Production Mgr., J. C. Chapman; Adv. Mgr., C. E. Wertman; Representatives, W. W. Totman, Geo. C. Steil, L. C. Biglow. N. Y. Show Space, C-100.

K. R. Wilson—Owner, K. R. Wilson; Sales Mgr., B. J. MacAniff. N. Y. Show Space, D-121; Chicago, 89 and 90.

Winterknight Equipment Co.—Engineer, N. Weldon Flinchbaugh; Sales Mgr., H. A. Winterknight, Jr.; Production Mgr., F. T. Flinchbaugh; Adv. Mgr., H. A. Winterknight, Jr. N. Y. Show Space, D-145.

Wire Wheel Corp. of America—Vice Pres. and Gen. Mgr., O. J. Rohde. Branch Mgr., H. F. Howard; N. Y. Branch Mgr., W. M. Greene; Factory Mgr., W. W. Davison; Western Factory Representative, R. D. Webster; Pacific Coast Mgr., C. H. Walker; Engineer, H. A. House; Sales Mgr., H. G. Jackson; Phila. Branch Mgr., W. H. Metcalf; Detroit Factory Representative, L. P. Chittenden; Sales Department, H. R. Hackett. N. Y. Show Space, C-28; Chicago, 25 and 26.

Wisconsin Top Co., Inc.—Sales Mgr., B. E. Myrup; Sales Director, H. C. Beauchley; N. Y. Distributor, H. S. Evans; Adv. Mgr., B. E. Myrup. N. Y. Show Spaces, 183 to 185; Chicago, 1908 Indiana Ave.

Witherbee Storage Battery Co.—Pres., Charles Meder; Vice Pres. and Sec., Nathan Wise; Treas. and Engineer, Charles Sautt; Sales Mgr., A. D. Stevenson; Production Mgr., Peter Becht; Adv. Mgr., R. H. Dippy; Representatives, A. D. Stevenson, L. L. McGuire, George Meder. N. Y. Show Space, D-164.

F. Wolkow & Sons—Representatives, I. Leo Wolkow, J. D. Wolkow. Chicago Show Space, 91.

World Metal Products Corp.—Pres., Basil J. Tsivoglou; Vice Pres., W. N. Herold; Sec., C. V. Tsivoglou. N. Y. Show Space, D-168.

Wyman-Gordon Co.—Vice Pres., H. G. Stoddard; Metallurgist, J. H. Nelson; Engineer, J. A. Gldson; Sales Mgrs., J. D. Sutherland, R. M. Powell; Adv. Mgr., F. E. Wellington. N. Y. Show Space, D-221.

Yellow-Jack-It Bunnell Co.—Pres., S. A. Bunnell; Vice Pres., Louis R. Cooke; Sec., D. W. Bunnell; Representatives, Allan Morgan, Geo. D. Ingram. N. Y. Headquarters, Room 600, 9. S. Clinton St.; Chicago Show Space, 43 and 44.

Zenith Carburetor Co.—Pres., V. R. Heftler; Sales and Adv. Mgr., V. I. Shobe. N. Y. Headquarters, McAlpine Hotel; Chicago Show Space, 35.

B. F. Zimmerman Mfg. Corp.—Representatives, B. F. Zimmerman, H. A. Waldron, C. E. Adams. N. Y. Show Space, D-228; Chicago, 12, Gallery.

PROGRAMME.**MEETINGS AND DINNERS DURING AUTOMOBILE SHOW WEEK, JAN. 7 TO 14.**

AMONG the numerous meetings of national importance, luncheons and banquets, which always add to the importance and gaiety of Automobile Show week in New York, Jan. 7 to 14, may be mentioned the following:

Monday, Jan. 9.

2:30 p. m.—Meeting, Traffic committee, National Automobile Chamber of Commerce, at headquarters.

8:00 p. m.—Meeting, National Highway Traffic association, Automobile Club of America.

7:00 p. m.—Dinner, Rubber Association of America, Waldorf-Astoria Hotel.

7:00 p. m.—Dinner, Old Timers' Club, "S. S. Flotilla," 100 West 55th Street.

Tuesday, Jan. 10.

10:00 a. m.—Meeting, Export Managers' committee, National Automobile Chamber of Commerce, at headquarters.

10:00 a. m.—Meeting, Truck Standards committee, National Automobile Chamber of Commerce, at headquarters.

2:30 p. m.—Meeting, National Motor Truck committee, National Automobile Chamber of Commerce, at headquarters.

2:30 p. m.—Meeting, Patents committee, National Automobile Chamber of Commerce, at headquarters.

7:00 p. m.—Banquet, National Automobile Chamber of Commerce, Hotel Commodore.

Wednesday, Jan. 11.

10:30 a. m.—Meeting directors, National Automobile Chamber of Commerce, at headquarters.

10:30 a. m.—Meeting, Executive board, American Automobile association, Metropolitan division, headquarters, 501 Fifth Avenue.

3:00 p. m.—Meeting, Legislative committee, National Automobile Chamber of Commerce, at headquarters.

7:30 p. m.—Banquet, Motor and Accessory Manufacturers' association, Hotel Commodore.

Thursday, Jan. 12.

7:00 p. m.—Banquet, Society of Automotive Engineers, Hotel Astor.

PRICES OF STANDARD TOURING CARS FOR NINE YEARS.

| | 1913 | 1914 | 1915 | 1916 | 1917 | 1918 | 1919 | 1920 | Jan. 1921 | July 1921 |
|--------------------|--------|--------|--------|--------|--------|--------|--------|--------|-----------|-----------|
| Auburn | | | 1,050 | 1,085 | 1,295 | 1,595 | 1,595 | 1,695 | 1,895 | 1,690 |
| Buick | 1,285 | 1,335 | 1,235 | 1,020 | 1,070 | 1,265 | 1,595 | 1,495 | 1,795 | 1,525 |
| Chalmers | 1,950 | 1,775 | 1,650 | 1,090 | 1,250 | 1,565 | 1,565 | 1,685 | 1,795 | 1,545 |
| Chandler | 1,785 | 1,595 | 1,595 | 1,295 | 1,395 | 1,595 | 1,795 | 1,895 | 1,895 | 1,785 |
| Chevrolet | 875 | 875 | 490 | 490 | 635 | 865 | 865 | 735 | 820 | 645 |
| Dodge | | 785 | 785 | 785 | 785 | 885 | 1,085 | 1,085 | 1,285 | 985 |
| Ford | 550 | 490 | 440 | 360 | 360 | 525 | 525 | 525 | 440 | 415 |
| Franklin | 2,900 | 2,300 | 2,150 | 1,950 | 1,950 | 2,250 | 2,650 | 2,850 | 2,700 | 2,650 |
| Haynes | 2,700 | 2,785 | 1,550 | 1,495 | 1,725 | 2,150 | 2,485 | 2,685 | 2,935 | 1,985 |
| Hudson | 2,250 | 2,350 | 2,350 | 1,650 | 1,650 | 1,975 | 2,100 | 2,200 | 2,400 | 2,250 |
| Kisselkar | 2,500 | 2,350 | 1,650 | 1,455 | 1,295 | 1,385 | 1,645 | 2,975 | 3,475 | 3,475 |
| Locomobile | 5,100 | 5,100 | 5,100 | 5,400 | 5,000 | 6,600 | 7,550 | 8,100 | 7,550 | 8,600 |
| Marmon | 5,000 | 5,000 | 5,000 | 2,950 | 3,100 | 3,550 | 3,950 | 4,650 | 5,000 | 3,985 |
| Maxwell | 750 | 695 | 695 | 595 | 745 | 895 | 995 | 985 | 995 | 845 |
| McFarlan | 2,590 | 2,590 | 2,990 | 3,500 | 3,550 | 4,300 | 4,300 | 4,300 | 6,300 | 6,300 |
| Mitchell | | | 1,250 | 1,325 | 1,425 | 1,510 | 1,475 | 1,750 | 1,750 | 1,490 |
| Moon | 2,150 | 2,250 | 2,250 | 1,295 | 1,095 | 1,685 | 1,885 | 1,985 | 1,985 | 1,985 |
| National | 2,375 | 2,375 | 2,500 | 1,750 | 1,995 | 2,450 | 2,450 | 3,290 | 3,750 | 2,990 |
| Oakland | 1,075 | 1,785 | 1,200 | 875 | 990 | 1,185 | 1,075 | 1,165 | 1,395 | 1,145 |
| Overland | 985 | 950 | 1,075 | 750 | 795 | 1,095 | 985 | 985 | 895 | 695 |
| Pierce-Arrow | 5,000 | 5,000 | 5,000 | 5,000 | 5,500 | 5,500 | 6,500 | 7,750 | 7,500 | 7,500 |
| Premier | 2,785 | 2,700 | 2,300 | 1,685 | 2,285 | 2,585 | 2,585 | 4,300 | 4,600 | 3,890 |
| Stutz | 2,050 | 2,150 | 2,275 | 2,550 | 2,550 | 2,750 | 2,850 | 3,350 | 4,000 | 3,350 |
| Vellie | 2,000 | 2,350 | 2,015 | 1,065 | 1,185 | 1,340 | 1,465 | 1,885 | 1,885 | 1,555 |
| Winton | 3,250 | 3,500 | 3,500 | 2,335 | 2,735 | 3,000 | 3,200 | 4,250 | 4,600 | 4,600 |
| Total | 51,905 | 53,085 | 52,095 | 43,753 | 46,360 | 54,500 | 59,170 | 69,070 | 73,640 | 67,915 |
| Average | 2,359 | 2,308 | 2,084 | 1,750 | 1,854 | 2,180 | 2,367 | 2,763 | 2,946 | 2,717 |
| Median | 2,200 | 2,200 | 1,600 | 1,200 | 1,300 | 1,500 | 1,700 | 1,900 | 1,900 | 1,900 |

(Continued from Page 16.)

demand from 1916 to 1921 they rose steadily. At the peak of prices in the beginning of 1921 the typical medium-priced car was selling for about 49 per cent. more than in 1916.

The price changes among the low-priced cars have been more rapid, but of smaller proportions. Their price advances from the low figures of 1916 came suddenly and were well maintained during the years of high commodity prices. Their reductions since the beginning of 1921 have been proportionately greater than those of the other cars.

The most expensive cars have advanced their prices with little interruption since 1913 until, in 1921, their general level of cost had risen to more than 60 per cent. above the 1913 figures. Their reductions, since the beginning of 1921, have been moderate.

The figures indicated on the table show that motor car prices have swung through a considerable range as costs and demand have changed with varying degrees of general prosperity and depression. The present indications suggest that even greater proportional changes may be expected in the future, as the industry, with its great productive capacity, competes for the sale of its output in markets where declining prices have sharply reduced the public's purchasing ability.

Mr. Ayres also brings forward special tables to show the number of persons in the entire population for each car in use each year, the percentage of the entire population in 1910 in age and nativity groups, cars in use each year for each 100 native white men of voting age, and people per car and adult native-born white men per five cars in use in 1920 by divisions.

So short a time ago as 1912 there were 114 people for each car in use, while eight years later there was one car for each 12 people. There is a great difference in the figures for the various divisions of the country, there being a car for every seven people in the states of the Pacific Coast division, while in the East South Central states there is one car for

every 27. There are states, such as South Dakota, Iowa, Nebraska, Kansas and California, so well supplied with automobiles that the entire population could probably go riding simultaneously. Such a statement as this inevitably will bring to mind the question of the limits to the ability of the country to purchase and use cars. On the other hand, it may be argued that, with only about 8,500,000 motor vehicles in use in a country of more than 105,000,000 people, great possible markets still exist.

Probable Purchasing Power of Various Groups.

Studying the composition of this population with reference to its probable purchasing power for automobiles, it may be noted that great deductions must be made from the total population of the country as soon as it is attempted to estimate the possible purchasers of automobiles.

The complete census data for 1920 are not yet available, but the census of 1910 gives a fairly reliable basis for discovering the proportions of the whole population found in certain great groups. To begin with, some 44 out of each 100 are less than 21 years of age, while four in each 100 are over 65 years old. This leaves 52 per cent. of the people from among whom the purchasers must clearly come. Of this 52 there are 17 who are immigrants and colored people. While there are in the aggregate many motor owners in these groups, it seems entirely probable that no very large number among them who do not already own cars will be able to purchase them during the next few years.

The remaining possible purchasers are the 35 per cent. consisting of native-born white men and women between the ages of 21 and 65. About half of these are women who in the main are the wives of the men. It seems to be a fair conclusion that the purchasers of automobiles will in their very great majority come from the 18 per cent. of the population who are native-born white men between the ages of 21 and 65. Since the population consists of some 105,000,000 people, this group comprises about 19,000,000.

Probably about half of them already own cars. This would seem to be safe conclusion, even after allowance has been made for the ownership of more than one car by one individual and the ownership of trucks and passenger cars by corporations.

Number of Wage Earners.

Another factor that enters into this estimate of probable purchasers of motor cars is the number of persons in gainful occupations. This class was recorded in 1910 as being over 38,000,000, of whom about 30,000,000 were men and boys. This number includes many young people for the entire male population above the age of 10 was 37,000,000. While many changes have taken place since 1910 in the distribution of people in occupations, it is probable that the changes in the proportions in each sort of work have not been so revolutionary as to make a study of the earlier figures misleading. Accordingly Mr. Ayres has gone through the data of the occupational census of 1910 and taken out of the lists of the gainfully employed all those engaged in such sorts of work as to make it improbable that they would be included among the purchasers of automobiles. Those subtracted from the number of men gainfully employed included common laborers, semi-skilled workers, apprentices and boys, clerks, stenographers, fishermen, lumbermen, soldiers, sailors, domestic and personal workers, life savers and lighthouse keepers.

These subtractions reduce the number of men wage earners in 1910 from 30,091,564 to only 16,865,546, and if this number is increased in proportion to the population, so as to make it applicable to the census figures for 1920, it becomes 19,384,584. Similar reductions among women workers bring their number down to a comparatively low point, but the changes in the occupations of women have been so considerable since 1910 that it seems best to omit them from the present calculations.

Three Sets of Evidence.

Three bodies of evidence have been reviewed which tend to indicate that the class of people in this country, among which many purchasers of automobiles may be found, numbers about 20,000,000. This is approximately the number of native-born white men. It is also about the number of white families. It also closely approximates the number of persons earning money who are in occupations sufficiently remunerative and of such a nature that they are not deterred from becoming purchasers of automobiles. All three bodies of evidence are in substantial agreement.

The Saturation Point.

Mr. Ayres believes that the available evidence is inadequate to permit making at this time a valuable estimate of the probable saturation point of the automobile industry. It seems clear to him that nearly every family would like to own a passenger car, that many individuals would like to own cars in addition to the family machines and that there are few commercial and industrial establishments that would not possess commercial cars, or trucks if they could.

It seems equally clear that no such

universal use of automobiles is possible at present or in the near future because a large proportion of the people cannot afford to purchase or run them. The only competent estimates of the distribution of incomes in the United States are stated to be those for 1910, compiled by Willard I. King in his volume entitled, "The Wealth and Income of the People of the United States." While those figures are now seriously out of date and do not represent present conditions, they are interesting to consider. Professor King's researches show that at that time, out of every 1000 families 694 (more than two-thirds) were receiving annual incomes of less than \$1000 and that some 95 per cent. of all received less than \$2000 a year. Estimates for 1920 will show marked increases over these figures, but the general lesson derived from the 1910 census will remain unchanged. The new figures, like the old ones, will show that many more than half of all the income receivers get less than \$1000 a year and this is true even after careful allowance has been made for the value of the produce of farmers that is consumed by themselves and their families without being sold.

The Value of These Figures.

The value of these figures in estimating the possibility of increased markets for automobiles is great. They indicate that increases in the domestic markets must be largely among the users of low-priced machines. Practically all wealthy families and a large proportion of those in moderate circumstances now own machines. The same generalization can be made with regard to nearly all prosperous business and industrial establishments and a large part of those that are no more than fairly successful. These individuals and firms of more than average money resources constitute the market for the more expensive vehicles. In the main this market has already been supplied and its future requirements will be largely for replacements and for gradual extension as economic well-being becomes more generally diffused.

Replacements.

The available figures indicate that about 8,500,000 automobiles were in use in 1920, and it seems certain that the number used in 1921 will be well in excess of 9,000,000. If the average length of service of the machines continues to be about six seasons, and if the number in use should not increase or diminish, this would require an annual replacement of no fewer than 1,500,000 machines a year. Up to the present time no such replacement figures have been even approached, but they are certain to come unless the use of automobiles markedly decreases. Most of the machines now in use are comparatively new. They are the output of the past five years, during which the annual production has been from 1,500,000 to more than 2,000,000, except for the war year of 1918. Previous to 1916 the output each year was much smaller. At the present time about half the machines in use are less than three years old.

It is sometimes suggested that the number of cars in use may actually decrease now that the abnormal wages of the war period are past. To Mr. Ayres,

however, it seems improbable that anything short of a prolonged era of serious business depression can force many people who now have cars to give them up.

Productive Capacity.

The productive capacity of the automobile industry in this country has been stated to have been 2,660,000 cars a year at the close of 1920. This figure is probably fairly accurate, for the cars produced in 1920 were about 2,200,000, with curtailed operations prevailing in the last three or four months. As new plants have since been completed, the country's present annual capacity is somewhat greater and may perhaps be in the neighborhood of 2,750,000. It almost surely lies somewhere between 2,500,000 and 2,750,000.

If all these plants should produce cars at their full capacity and if the cars should last on the average long enough

SAVE SURFACE OF FRENCH ROADS BY CUTTING TREES.

PARIS, FRANCE, Dec. 26.

—In certain sections of France it was found that the trees along the road caused moisture to settle on the surface of the road and hang there a large part of the day. It was the opinion of the French road builders that these wet places not only made the roads dangerous for driving, but also caused deterioration in the surface. Already a great many of the trees have been chopped down, which leads many tourists to believe that the damage was done during the war. There is no question but the removal of the trees spoiled many a picturesque spot, but the French officials who advocate the removal of the trees claim that this will make driving safer and save thousands of dollars in road construction.

to be registered during six seasons, the annual registration would soon be from 15,000,000 to 16,500,000. It has already been pointed out that registration figures are in excess of the number of cars actually in use at any one time, and the difference between the two numbers is equal to the annual elimination. This means that if the present productive capacity should be utilized to the full over a period of some years, and all the cars were used in this country, there would have to be from 12,500,000 to 13,750,000 actually operated to consume the annual output. If improved construction, more intelligent use, and better roads should increase the actual term of service of the cars to eight years instead of six, the number in use would have to be about 17,000,000 or 18,000,000 to take care of the production. This would mean that the number of cars in use would have to be twice as great as it is now to utilize our present car

manufacturing capacity. This seems to Mr. Ayres most unlikely in the near future.

Another consideration of no small importance is that if the number of automobiles should be doubled in the near future, some other motor power than gasoline would probably have to be developed to propel them.

It appears, then, that the country will shortly need about 1,500,000 cars annually if the use of automobiles remains at about its present status. Its productive capacity is more than 1,000,000 a year in excess of this.

There seems to be only two ways, according to Mr. Ayres, in which this capacity can be fully utilized. The first is through a continuing great increase in the use of cars until they are about twice as numerous as at present. The second is through building up an enormous export trade. In view of present economic conditions and future prospects here and abroad, both solutions seem to Mr. Ayres as highly improbable of realization.

HUGE INCREASE IN FARMS OF STATE.

SACRAMENTO, CAL., Jan. 1.—Some interesting figures were forthcoming in a recent report of Frank C. Jordan, secretary of state of California. In this report it was stated that there were 872 farms in California in 1850. In 1910 it was stated this number had increased to 83,177, while in 1920 the big total of 117,670 had been reached. This means, according to Mr. Jordan, that the increase in the last 10 years has been 29,473—nearly twice the increase of the 10 years 1900-1910.

"California's farm lands," states S. S. Nerney, manager of the W. L. Hughson Co., Federal truck distributor, "have seen wonderful development during the past 10 years. There are several reasons to explain this. The perfection of irrigation has done a great deal to reclaim arid soil, while new methods of agriculture have played their part. To my mind, however, one of the most vital forces that has made farming in California more profitable and alluring during the past decade has been the advent of the automobile and the motor truck.

"Figures don't lie and you can readily see how inaccessible farms have been made to pay by their owners who have the use of the automobile and the motor truck. In this connection the Federal truck and the Ford have been tremendous factors. Then, with the advent of the motor car the state's highways have become so improved that travel along them is now rapid and safe during all of the seasons. I look for a further development of our agricultural interests and believe that the motor truck's value will steadily increase as a method of transportation, not only here, but all over the country."

When a new and modern automobile hearse was recently introduced for the first time in Paris, by an undertaker, a crowd quickly gathered around and began talking in the most gruesome form of wit.

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This statement is based upon some figures recently given in an article written by Floyd W. Parsons, in which he says that the government figures show that 4,932,000,000 persons were carried in motor cars during the year 1920 as against 1,234,222,889 paying passengers carried on the steam railroads in the same year.

Insatiable Demand for Transportation.

The insatiable demand for transportation is evident in the fact that in the year 1906 the population of New York City averaged 298 rides per person on the urban railways of that city, while in the year 1920 the average number of rides per person of the population was 421.

Ever since the automobile came into general use we have been told that the demand for it was fully supplied and this statement has been vociferously reiterated of late, coupled with a reference to the fact that there are about 9,000,000 motor vehicles of all sorts in use in the United States today.

That I might compare our present automobile equipment with the number of horse-drawn vehicles in use before America was motorized I have tried in vain to get some reliable statistics as to the number of buggies, carriages, carts and trucks in use before the automobile had commenced to seriously displace them. I have, however, obtained some figures which shed a little light on the subject.

When Horse-Drawn Transportation Was at Its Zenith.

I am informed that, in the year 1904, 1,400,000 horse-drawn passenger vehicles, including light wagons and carriages were produced, and that the total production of horse-drawn farm wagons, trucks and freight-carrying vehicles was about the same. The authority from whom I have obtained this information tells me that there was probably an average annual production of 2,200,000 horse-drawn vehicles of all sorts during the five years ending with 1904, when the advent of the automobile had the effect of reducing the production of horse-drawn vehicles. Assuming an average life of, say, five years for the horse-drawn vehicles, these figures would indicate that in the year 1904 there were in use in the United States at least 11,000,000 horse-drawn vehicles of all sorts.

This, it is to be borne in mind, was 17 years ago. Since then our population has increased by probably 20,000,000 and Professor Anderson, economist of the Chase National bank, estimates that the net income of our people has risen from \$21,500,000,000 to over \$73,000,000,000 annually.

If the automobile had not been invented and we had continued to be dependent upon horse-drawn vehicles for transportation it is probable that many more than 11,000,000 buggies, carriages, wagons and trucks would today be required to provide for the passenger and freight traffic that could not be carried on the railroads.

The horse-drawn vehicle is rapidly becoming obsolete and to take its place we are now, so it is said, provided with 9,000,000 motor vehicles of all sorts. I am inclined to think that a substantial portion of these 9,000,000 motor vehicles

are also obsolete or in a condition of innocuous desuetude, but assuming that they are all efficient and useful it is, I think, an error to conclude that they can begin to meet the transportation requirements of the American people, to satisfy which 11,000,000 horse-drawn vehicles were required 17 years ago. This is my main reason for believing that it is a mistake to insist that the American demand for automobiles has reached its peak and that it must hereafter show a decline.

An Estimate of Future Requirements.

Any estimate of our future requirements must be guess work, but allowing for the increase in wealth and population and the increased dependence of the population upon transportation it would seem reasonable to assume that a total of at least 20,000,000 automobiles would be necessary to supply the present demand of America for the swift and rapid movement of its people and its products.

In a paper read by Ezra W. Clark in New York last January I notice the following statement:

"We have in the United States 2,478,552 miles of highways, or 10 times the mileage of our railroads. Twelve per cent., or 299,135 miles of these highways, are surfaced roads. Think of it, already we have more hard roads than miles of railroad and railroad building has almost stopped while good road building is just beginning."

The convenience, economy, promptitude and comparative safety of motor truck transportation is just beginning to be appreciated. I venture the prediction that as it becomes better understood the proportion of short-haul freight traffic carried by motor truck will increase with amazing rapidity. The railroads have long complained that there was no money in the short-haul traffic. They should, therefore, be thankful that the motor truck is taking it from them and I shall not be surprised to learn that in the near future many of them will follow the example of the Boston & Maine railroad, which has recently abandoned two of its branch lines on account of automobile competition. This abandonment will be a distinct gain to the Boston & Maine, for the total freight revenue of one of the lines in 1920 was only \$88, while the other collected but \$1713 in all and had an operating expense of \$12,940.

Sir Henry Thornton, the former manager of the Long Island railroad and now head of one of the greater railway systems of Great Britain, has been recently quoted as saying that the American branch lines will find it necessary to use lighter engines and freight cars if they are to survive, but it is to be doubted whether even a resort to this expedient will enable them to meet the competition of the motor truck successfully.

Obsolescence of the Canal.

Everything that man has thus far devised seems destined in time to become obsolescent. With the completion of the Erie canal in 1825 a great canal building boom set in in this country. It resulted in the construction of the Delaware & Hudson canal, the Chesapeake & Ohio canal, the Dismal Swamp canal, the Albe-

marle & Chesapeake canal and the net work of canals which, though but little used, still gridiron parts of Ohio, Georgia and several other states. The panic of 1837, which was brought about by the large investment in canals, put an end to canal building and railroad construction soon commenced to make the canals that were built unprofitable.

Now it seems likely that the motor truck will make at least a portion of our railway system obsolescent, but it will enhance the value and earning power of the trunk lines and relieve the roads of a traffic which has become unprofitable. It is not, therefore, in my opinion to be regretted even from the standpoint of the investor who must look to income and the economies with which the roads can be operated rather than to the volume of traffic for a return upon his investment.

Taxicab and Motor Bus Traffic.

And then there is a third division of motor traffic whose possibilities we have in my judgment just commenced to sense. It is the taxicab and motor bus traffic. Those Americans who were in the habit of visiting England before the war always came back envious of the apparently inexhaustible equipment of taxicabs operated at low fares with which London was supplied. In no American city that I am aware of has the taxicab equipment as yet commenced to approach that which London enjoyed prior to 1914. I say prior to 1914 because I understand that the cost of "petrol" and labor has since the war resulted in a reduction in the number of taxicabs in use in London.

There is, however, no reason why our great American cities should not be supplied with taxicabs that can be operated at fares just as low as those formerly charged in London. It is only a question of habituating the people to their use, and as to the urban and interurban motor bus traffic that can and will be developed — imagination cannot even glimpse its possibilities. There is, I think, every reason to expect that within a comparatively short period motor busses will be operated between nearly all the adjacent towns and cities of the country and that the Latin poet's "rus in urbe" will become indeed a reality in 20th century America; 51.9 per cent. of the American people now reside in cities or towns having a population of 2500 or more. Twenty years ago the urban population was only 29 per cent. of the total.

Impossible to Arrest Cityward Tendency.

It seems impossible to reverse or arrest the cityward tendency that these figures disclose and the result is a constant increase in the demand for transportation between the cities and the country. The New York newspapers estimate that over a million people left the Metropolis on the Friday and Saturday before Labor Day to return on the succeeding Tuesday morning. To have moved an army of a million people out of New York and back again would formerly have been impossible, but it was made possible chiefly by the automobile and as a larger and larger proportion of our population congregate in the cities the need for swift and commodious transportation will increase cumulatively. It can

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vised which will allow the high finish of the car body to be maintained for an indefinite period. Further, the use of the so-called automobile "washing soap" is considered unnecessary for highly finished surfaces, but if a soap must be used, some pure white soap is recommended, which contains a smaller amount of alkali than others as alkali has a tendency to leave it covered with small white spots which are practically impossible to remove.

The body should receive only water and possibly in extreme cases a soapy water made of pure soap, shaved fine to make it dissolve quickly. As soon as possible after the soapy water has been applied to the body panels it should be rinsed off with cold water, using only light pressure, preventing the panels from streaking and, after being thoroughly rinsed, drying at once with a clean chamois.

The washer should provide himself with two sponges and two chamois, one of each for the body and chassis respectively. The chassis sponge or chamois never should be used on the body or the body sponge and chamois on the chassis. More or less grease and oil are always present on the chassis units and becoming embedded in the sponge or chamois, are difficult to remove. If later used on the body the oil will show quickly, dulling the finish.

Treatment of New Car.

On receiving a new car from the factory or distributor, it should be placed on the wash stand, thoroughly washed and rinsed, soft coal dust often enters the freight car in which the car is shipped from the factory, embedding itself in the green varnish, and can only be removed with care and patience. After the car is washed, before it is delivered to the customer, it should be sprayed at intervals with a light stream of water to harden the varnish. The harder the varnish the less likely it will be for it to pick up dust from the road and the longer the factory finish will be retained.

If obliged to drive during a rain storm, as soon as the car enters the garage, it should be run on the wash stand and the heavy mud rinsed off at once. This will assist when later the car is given a thorough wash.

Road Treating Substances Injurious.

Road tar, the bane of all autoists, is probably one of the most difficult substances to remove from the under side of the mud guards and running gear of the chassis that the motorist encounters. So far as has been devised up to the present time the best method of removing it from the underside of the guards seems to be scraping, later washing the guard with soap and water or kerosene. Tar will dissolve slightly in kerosene and the latter is often used for removing spots from the top of the guards or from points about the body.

The heavy oil often used on highways also offers a problem in its removal without injuring the painted surfaces. Mixed with road dust this material becomes caked around the axle housing, on the brake drums and other parts of the chassis, and can only be removed by scrap-

ing, afterwards washing with gasoline or soapy water followed by rinsing with cold water.

A third material which is often encountered on roads treated for dust has more of an alkali reaction. This substance in dry weather does no harm to passing automobiles, but if the day is rainy or the ground is slightly moist, the road-treating substance is picked up by the rapidly moving wheels and is thrown all over the outside of the guards, running gear and often reaches the lower body panels. Wherever it touches, white spots are seen in the finish, indicating that the alkali has attacked the varnish. It is very difficult to remove these spots and usually this cannot be done successfully without refinishing. The autoist should drive slowly whenever a stretch of road is encountered which is known to be treated in this manner.

To Keep Engine Hood Bright.

How often a car may be noticed which has a high finish on every part of the body and guards with the exception of the engine hood. The hood material must be able to withstand the heat of the engine and the finish applied also must have special treatment as to its finish. Hoods painted in a manner similar to the body dull quickly, because of the excessive engine heat. Manufacturers are at present striving to meet this condition by enamelling the hoods and baking them at high temperature in special ovens. This in a measure prevents the hood from dulling quickly. However, whenever the car is returned to the garage after driving in fog or rain the hood should be immediately dried off to prevent moisture forming, which will tend to injure the finish. Accumulations of oil and dust on the interior of the hood cover help to retain heat and should be removed with waste whenever noticed. This also will add to the clean appearance of the car, preventing excessive oil working through the louvers at the sides, presenting an unsightly appearance.

(Continued from Preceding Page.)

only be met through the use of the passenger motor car and the automobile bus, and the increase in the demand for and use of these vehicles will, I think, be simply astounding.

And then there is the problem of provisioning the huge populations that are gathered in our cities. Can it be met in any other way so well as with the motor truck? I think not, for the motor truck enables the individual farmer to bring his produce to town and escape all the hazards of delay, breakage and misshipment that he incurs when he uses the railway.

In Summarization.

My reasons for believing in the automobile may therefore be summarized as follows: First, the insatiate demand for transportation which seems to increase more than twice as rapidly as the population. Second, that the number of automobiles of all sorts in use today is less than the number of horse-drawn vehicles in use 17 years ago. Third, the superior economy, speed and reliability of motor transportation. Fourth, the cityward

tendency of our population, which implies a constant increase in the transportation facilities for both freight and passengers without which the urban population would starve and business would be at a stand-still. Fifth, the fact that the railroad short lines are being gradually abandoned and railroad building has practically stopped, thus leaving the American population of today entirely dependent upon the automobile for the necessary increase in the transportation facilities required.

(Continued from Page 21.)

March 11-18—Bronx, N. Y., Bronx County Automobile Show, Passenger Cars, Trucks and Accessories, 105th Field Artillery Armory, 166th Street and Franklin Avenue; Manager, H. G. Stiles, 2483 Tiebout Avenue, Bronx.

March 11-18—Newark, N. J., Automobile Show, Newark Automobile Dealers' Association.

March 11-18—Boston Show, Mechanics' Building.

March 13-18—Boston, Mass., Automobile Salon, Boston Automobile Dealers' Association, Inc., Copley Plaza Hotel; Manager, Chester I. Campbell.

March 13-18—Omaha, Neb., Automobile Show, Omaha Automobile Trade Association, Auditorium; Manager, A. B. Waugh.

March 15-18—Port Huron, Mich., Automobile Show, Port Huron Automobile Dealers' Association.

March 21-22—Ypsilanti, Mich., Automobile Show, Ypsilanti Automobile Dealers' Association.

March 23—Philadelphia, Pa., Sectional Meeting, Society of Automotive Engineers.

March 24—Detroit, Mich., Meeting, Society of Automotive Engineers.

March 24-25—Ann Arbor, Mich., Automobile Show, Ann Arbor Automobile Dealers' Association.

March 27-April 1—Oklahoma City, Okla., Sixth Annual Automobile Show, Coliseum, Oklahoma City Motor Car Dealers' Association; Manager, Edgar T. Bell.

March 28-31—Benton Harbor, Mich., Automobile Show, Benton Harbor Automobile Dealers' Association.

March 31—Chicago, Ill., Mid-West Meeting, Society of Automotive Engineers, "Various Commercial Fuels and Their Relative Characteristics."

April—Buffalo, N. Y., Second Annual Motors and Sportmen's Show, Automobile Club of Buffalo; Manager, D. H. Lewis.

April 2-8—Battle Creek, Mich., Automobile Show, Battle Creek Automobile Dealers' Association.

April 27—Philadelphia, Pa., Sectional Meeting Society of Automotive Engineers.

April 28—Detroit, Mich., Meeting, Society of Automotive Engineers.

May—Trenton, N. J., Annual Convention, New Jersey Automotive Trade Association; Secretary-Treasurer, H. S. Moore, Trenton.

May 1-75—Scheveningen, Netherlands, Second Annual Automobile Exhibit; Secretary, No. 185 Spui, The Hague.

May 16-18—Chattanooga, Tenn., Convention and Exhibition, Southeastern Hardware and Implement Association (Alabama, Florida, Georgia, Tennessee); Secretary, Walter Harlan, Jacksonville, Fla.

June 11-15—Milwaukee, Wis., International Convention of Associated Advertising Clubs of the World.

June 19-25—Colorado Springs, Col., Summer Meeting, Automotive Equipment Association.

September—Rio de Janeiro, Brazil, Automotive Exhibition in connection with Brazilian Centenary.

Sept. 18-23—Rome, Italy, Second Annual Meeting, International Chamber of Commerce.

Nov. 13-18—Chicago, Ill., Annual Convention and Business Exhibit, Automotive Equipment Association, Coliseum.

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DISTILLED WATER.

Distilled water is, of course, essential for the storage battery. It is not always possible to procure this easily and any car owner can very easily distill water by using a very simple apparatus. Have a length of annealed copper tubing coiled, so that it will fit in a dish pan. Connect the end of the copper tubing with an ordinary tea kettle by means of a short piece of rubber tubing; the other end of the tubing is curved so that the water passing down will drip into a bottle or other container. The dish pan in which the coil rests is filled with cold water, frequently renewed to keep it cold. The water in the tea kettle is boiled and the steam so produced passes out of the spout into the tube, through the coil, where it is cooled and condensed back into water again and is finally collected for use in the bottle at the end of the copper tube.

HEADLIGHT POLISH.

First clean the reflector by trickling water over it. Then dip damp cotton in jeweler's rouge and polish spirally, starting at the lamp bulb. Dampened chamols skin is even better than cotton.

CAST IRON CRACK FILLER.

This is composed of Japan dryer, 2½ ounces, and finely ground dry white lead, 1½ ounces. These are carefully mixed

and then added to a quart of finished Japan and enough rotten stone is added to make a thick paste.

CROSSING RAILWAY TRACKS.

In crossing railway tracks at grade the automobile driver should make it a practise to throw the gear shift into a lower gear, rather than try and make the crossing in high gear. By continuing in high the possibility of the engine choking is greatly increased, which might cause the car to stop in the center of the crossing. Many an accident has been caused by the engine going dead on a crossing, and the result has been lives lost or persons injured.

When making engine adjustments it is usually necessary to have patience, for the reason that the results of adjustments are not always instantly apparent. In adjusting the needle valve of the carburetor, for instance, the engine must have time, say four or five seconds, before the change becomes effective. This is because there is frequently an excess of gasoline in the inlet manifold, and so the variation in the volume from the spray nozzle does not affect the running of the engine immediately.

Opinions differ as to the value of the four springs used to hold the chains from sagging. If they hold the chains from creeping they are damaging, but if they are properly fitted they are all right.

SPEEDOMETER HINTS.

When a car is equipped with a transmission driven speedometer the rear wheels should never be spun or permitted to slide. The habit is likely to break the speedometer shaft, some times causing an error in the odometer reading of from two to five per cent.

OIL STEERING KNUCKLE.

The removal of play in the steering knuckle necessitates the installation of new front axle bushings. These are the ordinary bronze bushing type and after they have been put in place they should be liberally supplied with lubricant in the shape of graphite or grease.

DO NOT DRIVE ON CAR RAILS.

With nearly a million new drivers on the roads this year there may be excuse for reiterating the suggestion that running on the car tracks is a costly habit as regards wear on tires. The small, sharp pieces of steel that flake off from the tracks cut the rubber and tear the tread, costing the motorists of America many miles of honest tire wear each year. Keep off of the car tracks as much as possible.

Be extra careful about closing the clamps at the sides of the chains. If they come loose an expensive chain will be lost, and there will be no intimation of where you dropped it.

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THE accompanying illustration shows the new daylight service building of the Neel-Cadillac Co., 25th and Locust streets, Philadelphia, Pa., which covers 120,000 square feet of floor space and is pronounced by those who have visited it as one of the largest and most up-to-date stations of its type in that section. The method of service offered its patrons is systematized and efficient to the nth degree. On entering the station with his car the Cadillac owner makes his wants known to a service salesman in the service office. In the event

the driver is not sure what should be done, the test department, which works hand in hand with the service office, sends a tester to diagnose the necessary work. This same tester, after the completion of the work, gives the car its final test and adjustment. The test department is in no way responsible to the shop for its operation, but is responsible directly to the service office. This method insures personal interest in any attention to each individual case. From this point the cars are carefully routed to the various departments.

THE paint, body and upholstery departments occupy an area of 20,000 square feet. The paint department has varnish rooms with a capacity of six cars a day. Every precaution has been taken to eliminate dirt and dust from these rooms, which are maintained at a uniform temperature by automatic control. In the paint department there is a cleaning rack to prepare bodies and chassis for the work of finishing, and final washing of the paint job is also done here.

Individuality is the keynote expressed in the company's upholstery work for both open and closed cars. This department specializes in tailor-made slip covers, re-upholsters bodies, re-covers tops, Victoria or any other special tops. The wood and metal work departments can handle efficiently any damage caused by accident or collision, regardless of its extent, and rebuild the damaged body or parts to look like new.

Foremost among the features in the mechanical repair department is the machine shop, said to be one of the most completely equipped in the country. It is supplied with a full line of special tools authorized by the Cadillac Motor Car Co., to speed up repairs and adjustments. Seldom will a visitor to this service department find a repair man lying upon his back working under a car. For this contingency the front or back of the car

is raised from the floor by means of tri-block holsts, operating on the I-beam rail system, which runs around the entire shop. This device greatly conserves human strength. On the third floor is a completely equipped blacksmith shop with forges and a large number of special tools made expressly for Cadillac repair work.

The larger portion of the second floor is devoted to the parts department in which is carried a complete line of Cadillac parts. Particular attention is also called to the oiling and greasing depart-

ment, which is an essential branch of the company's service plan. Here has been installed a systematic scheme of lubricating the car at a minimum flat-rate charge. A record of each owner's car, on which this schedule is used, is kept ready for immediate reference the next time it is necessary to carry out the succeeding steps in oiling and greasing.

The warranty department is also on the second floor, where adjustments on new cars are cared for. Here is also the accounting department. The superintendent's office is on this floor likewise. The purchasing department, as well as the shipping and receiving rooms, are on the first floor. A branch of the main accessory department, including a new car display, is also on this floor.

The main headquarters of the Neel-Cadillac Co. are at 142 North Broad street, Philadelphia, and the company maintains branches at Reading and Pottsville, Pa., and Camden, N. J. Herbert T. Hare is the manager of sales promotion.

TWO MILLIONS FOR HIGHWAY BUILDING

HIGHWAY construction work involving an expenditure for good roads amounting to \$223,885,000 the coming spring and summer has been authorized in the states of the Middle West, Illinois, Missouri, South Dakota, Michigan, Colorado, Minnesota, Indiana, Iowa, Kansas, Nebraska, North Dakota and Wisconsin.

CARE OF TIRES.

The life of a tire depends upon the air it contains. The more air, ordinarily, the longer the life. Thus a 3½-inch tire will require 70 pounds, and a four-inch tire 80 pounds. A small matter, but important.

BRAKE DRUM OUT OF TRUE.

(G. D. J., Philadelphia, Pa.)

My new car makes a peculiar rubbing sound at the left rear wheel each time it revolves. By jacking it up I find that the service brake band touches the drum at a certain point in each revolution of the wheel. Adjusting the band to clear this point prevents the use of the brake for that wheel. What remedy would you suggest?

The service station where you purchased this car should remedy this trouble for you, as it is probably due to the drum being out of true. If the service station is not near, remove the wheel from the axle and take it to a local machine shop, where the drum can be removed, placed in a lathe and turned true or concentric.

READJUSTING CARBURETOR FOR WINTER DRIVING.

(D. J. W., Scranton, Pa.)

Why is it necessary to open the needle valve of the carburetor a little more for winter than is required for summer driving? My mixture has lately been weak and I find that my instruction book says that the needle valve adjustment should be opened slightly when cold weather comes on.

Cold gasoline is less volatile than warm and thus more is required to start an engine having a given size of carburetor jet in cold than in warm weather. The grade of commercial gasoline sold for fuel today requires considerable heat to make it vaporize readily. The cold unburned fuel lying along the inside of the intake manifold will not vaporize until the engine is warmed. Again more gasoline is required to offset the additional quantity of oxygen taken into the carburetor in cold weather, as cold air contains more oxygen than warm air and a larger quantity of gasoline is required to complete the mixture. The practical reason, however, for increasing the fuel feed is because in cold weather only a part of the gasoline vaporizes readily; thus an excess must be supplied to make up for the loss.

BROKEN TEETH IN FLYWHEEL STARTING RING GEAR.

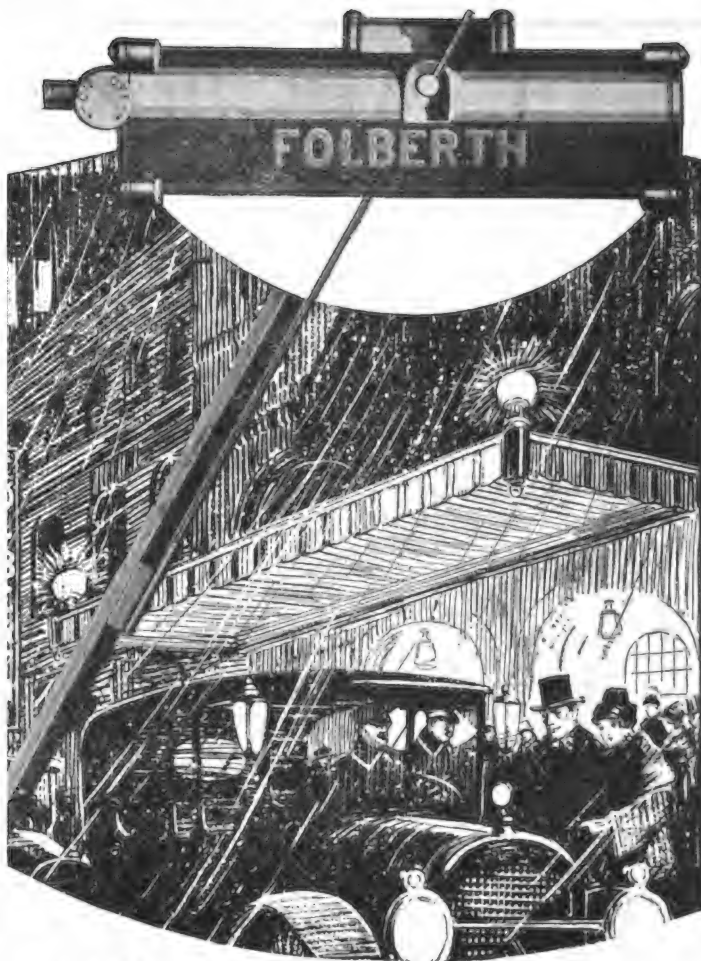
(H. G. S., Venice, Ill.)

My car, a ——— four-cylinder equipped with Auto-Lite starter and Bendix drive, has developed the habit of breaking teeth in the flywheel ring gear. I have replaced the fly wheel four times, the last time with steel starter ring gear, but with no better results. Otherwise my car is in splendid condition. What would you advise?

From the description given in your letter it would seem that the Bendix drive gear shaft is not properly lined up with the fly wheel gear. This must be in perfect alignment and the teeth must be well tapered on both gears at the point of contact when shifting gears into position. With a good steel band properly lined up with the Bendix starter gear this trouble should not occur if the starting motor is properly installed.

It might be occasioned possibly by carrying the spark too far advanced when starting the engine, causing the engine to backfire, which would have a tendency to break out the teeth before the over-running clutch of the Bendix drive could release the gear.

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VALVE TESTING.

(W. A. M., Newark, N. J.)

What is the best method to use for testing valves after grinding them to prove that they are right?

Probably the best and most used method is that of wiping the valve clean after grinding, and applying a very thin coating of Prussian blue to the valve face. Insert the valve in place against its seat and rotate it a small fraction of a turn. If the valves are ground properly there will be a continuous band of blue transferred to the valve seat. Do not rotate the valve very far or the result of the test will be uncertain. Instead of the Prussian blue, a series of closely spaced pencil marks may be placed squarely across the valve face, and the valve put in place and rotated a very little. If all of the lines are broken the seating is continuous. The ability of a valve to hold gasoline is another very good proof of its correct seating and this test usually can be given readily to overhead valves, but not so easily to L-head type valves unless the plugs over the valves have been removed.

MISSES ON HILLS.

(E. L. J., Wilmington, Del.)

What makes my car run well on the level in high gear, but miss on hills, when the engine will "hit" on all four cylinders as soon as I change into second or low speed?

Your engine is turning over rather slowly in taking hills, while when travelling on the level it is turning faster. Changing back into second or low allows you to run the engine faster, duplicating the condition of running on the level in high gear. Anything that prevents good ignition at low speed with full throttle opening may account for your trouble, such as poor compression, faulty carburetion, too wide spark gaps at the plugs, plugs with poor or cracked porcelains, or a weak spark plug coil. If the carburetor delivers too weak a mixture at low speed with full throttle, or if the gas line is somewhat obstructed, missing such as you describe will occur.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

BATTERY DISCHARGES QUICKLY.

(J. F. S., Winslow, Ariz.)

The storage battery in my Maxwell 1918 car discharges in about 30 days' time whether we run the car or not. The wiring seems to be in first-class condition, does not seem to be short-circuited or rubbing on the frame. Could you recommend a first-class battery to be used with this car or would it be advisable to use a high-tension magneto in connection with the system?

Your trouble is probably in the regulator which governs the charge from the generator to the battery, preventing the battery from discharging back through the generator when the engine stops. You will probably find that the points are stuck together, allowing a short-circuit through the generator. The adjustment of this regulator is very delicate and should be attended to by factory experts or someone who understands this work thoroughly. The addition of a high-tension magneto to displace the battery ignition which you now use might help, but the battery ignition under all ordinary conditions should work satisfactorily.

CARBURETOR LEAKS.

(R. K. T., Oakland, Cal.)

The Zenith carburetor on my Chevrolet 490 car persistently overflows at the rate of about four or five drops a minute. I have put in a new valve and seat and have adjusted the float to different levels, but it still leaks, forcing me to close the shut-off valve whenever I stop the car. What is the reason for this condition?

Your trouble is apparently in the float valve, which we should judge you have neglected to grind to a perfect seat. Remove the valve and with a little grinding compound grind this valve to its seat with a half-rotary motion as you would an engine valve, being careful that the abrasive does not get into the fuel line or carburetor bowl. Re-set the float to permit too high a level and your trouble should disappear.

ALLOWING ENGINE TO RUN IDLE.

(H. L. A., Blackstone, Mass.)

When a cold engine is started, does it pay to let it run idle to warm it up before attempting to start the car?

This practise is pretty generally recommended and is followed by many drivers who drive their own cars. Warming the engine before starting prevents missing and skipping on the road for the first half mile or so, or until the engine has become warmed. Racing the engine to hasten the warming up should be avoided as a racing engine running idle has a tendency to harm the bearings and loosen them more than several hundred miles of use.

The oil warms slowly in a cold engine and should be allowed to heat gradually or it would be still better to draw off the summer oil and refill the engine reservoir with a grade suitable for winter driving; an oil which is not susceptible to low temperatures and that will flow in freely between the bearing surfaces. This will assist in starting and insure the engine a supply of oil soon after it is started. A raced engine at starting often operates during cold weather for several minutes before the bearing surfaces receive oil and damage is pretty sure to follow this practise. Allow the engine to idle slowly without racing and by using the choker the car can be driven on the road in a very few minutes after starting, opening the choker gradually till the engine has become thoroughly warmed.

TRANSMISSION BANDS WORN.

(C. A. B., Milladore, Wis.)

1. The transmission bands jerk and grab on my 1917 Ford car when I stop or start the car. Can this be fixed by adjusting or should I reline the bands?

2. When coasting down hill, holding the gears in neutral with the emergency brake lever and throwing off the switch, the engine keeps on running. How can I correct this?

In answer to question No. 1, if your bands grab or jerk in stopping or starting, they are probably worn badly and if they have not been renewed within a year, relining is about the most effective remedy. Frequent adjustments will also make this course necessary. If renewed recently, adjusting the bands will remedy the trouble.

Second, use the foot clutch to separate the clutch discs instead of the emergency brake lever and you should be able to coast with the engine stopped without further trouble.

EXPANSION OF CAST IRON AND ALUMINUM.

(J. Mc. C., Fitchburg, Mass.)

Can you tell me how much greater is the expansion of an aluminum piston as compared to the expansion of a cast iron piston; also if they are durable?

The expansion of the average aluminum piston as compared to cast iron is about two to one. There are, however, aluminum pistons made that vary in the amount of their expansion, depending on the alloys used in manufacture. An aluminum piston, properly fitted, should prove as durable as a cast iron piston.

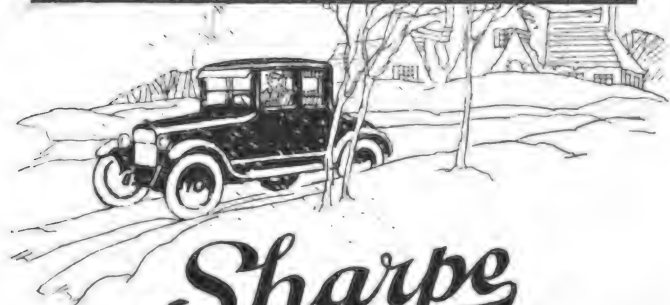
SPRING BUSHINGS WEAR QUICKLY.

(M. H. M., Springfield, Ill.)

Why do the bronze bushings on the ends of the springs in my truck wear out so rapidly? They are fitted with compression grease cups which I turn down at regular intervals and I feel that the lubricant must reach the inside of the bearings.

Bronze bushings fitted to motor truck spring shackles and springs wear excessively because the compression grease cups are not kept filled and are not turned down often enough. It is not enough that the operator turn the cup covers occasionally; he should keep the cup filled and turn the cover down hard enough to have the grease squirt out at the side of the spring bushings. Dust and dirt soon enter the ends of the bushing and, with the action of the springs, cut away the metal by abrasive action. If grease does not enter the bearing this abrasive action is continued in the bearings themselves, due to their dryness, and makes bushing renewal necessary at frequent intervals.

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It is much better to remove the old style compression grease cups and to install one of the numerous pressure systems on the market, replacing the old cups with nipples that will fit the extension socket of the pressure grease gun. Filling the bearings with lubricant in this manner at regular periods will force out all old dirt and grease, supplying fresh lubricant and preventing excessive wear at this point.

TIRE SLIPS ON RIM.

(G. I. D., Chicago, Ill.)

I am having trouble with my 34 by four-inch straight-side tires slipping on the rims and cutting off the valve stems. I claim that the circumference of the wheel felloe and tire is correct, but the trouble still continues. What is the reason for this and how can I figure the circumference of each?

The probable reason that your tires slip is that the wedges which hold the demountable rim to the wheel are not tight, but are worn and allow the rim and tire to slip together. Shimming the wedges or replacing them with new ones will probably prevent further valve cutting. Old tires with broken or weak beads might occasion the slipping that you mention, but we doubt if the tires would cause this. Rims badly bent, so much so that the joint does not come together for fastening, might also be a source of trouble. Examine the rims and if badly bent have them repaired or purchase new ones.

The circumference of a tire or rim is figured by multiplying the diameter of the tire or rim by the constant 3.1416, which gives the circumference in inches after pointing off four places from the right and placing the decimal point. Thus the inner circumference of a 34 by four-inch tire at the beads will be the diameter, 26 inches, multiplied by 3.1416, which equals 81.68 inches. The diameter of the rim will be 5/16 of an inch less, or 25 11/16 inches, giving a rim circumference of 78.75 inches, while that of the wheel felloe will be 11/16 of an inch less, or 25 inches, giving a circumference of 78.54 inches.

If further trouble occurs we would advise that you have some one at the tire factory branch examine your tire equipment and possibly they can correct it for you.

CLEANING CAR CHASSIS.

(T. M. W., San Francisco, Cal.)

What methods would you propose to keep the car chassis free from mud and dust? How would you go about cleaning it and how often should this be done?

The proper maintenance of the automobile chassis is of great importance. However, very few owners take the trouble to keep clean such working parts of their cars as are concealed by the body. All of the mud and dirt thrown up and plastered over the bottom of the car and chassis by the wheels, collect faster than one realizes. This dirt is powdered rock, very similar in its action to powdered emery, and if allowed to cover such important units as the transmission case, universal joints and differential housing, as well as the spring shackles, causes abrasive action to these units by being drawn into the small amount of lubricating oil or grease that works out of the joints and bearings with the consequent unnecessary wear which after a time will cut them out completely.

The transmission and other working units should be washed off at intervals with either gasoline or kerosene to remove this accumulation of grease and dust, after which they should be opened by a competent mechanic, the lubricant drained out, washed with boiling water and common baking soda, which dries quickly after use, and refilled with fresh lubricant of the grade recommended by the manufacturer for that particular unit.

The battery box may also be given needed attention at this time by sponging off the metal box supports, battery terminals, etc., with a solution of ammonia and water. This mixture neutralizes the action of any acid which may have slopped over on to the battery top, causing a deposit of salts around the battery box. Allowed to accumulate, the salts draw moisture and tend to cause the battery box to rot the connections, to sulphate.

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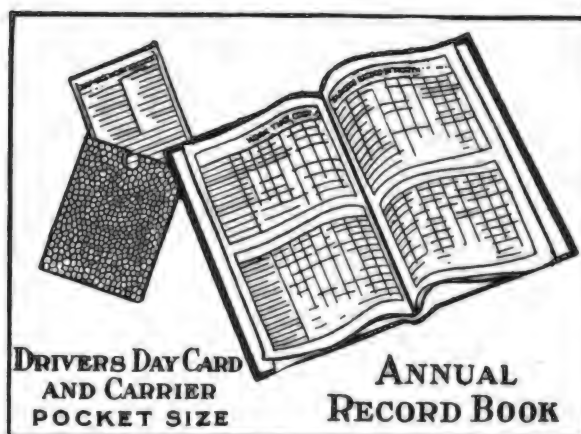
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THE AUTOMOBILE JOURNAL

VOL. LXIX.

PAWTUCKET, R. I., FEBRUARY, 1922.

NO. 6.

New York-Chicago Shows Add to Prestige of Industry

National Events Surpassing All Previous Exhibits in Value of Products Offered Set New Records for Sales and Attendance.

WITH more than 90 makers of motor cars and hundreds of accessory firms exhibiting their latest products, the most successful automobile shows in the history of the country have closed with an unusual number of orders booked and a general spirit of optimism prevalent that means good business for the coming year. Both at the New York and the Chicago show the attendance was very large, the records indi-

cating that the exhibitions surpassed all others in point of attendance. S. A. Miles, manager of the exhibitions for the National Automobile Chamber of Commerce, states that this season's display ranks as a veritable achievement and unquestionably was the finest display of cars that was ever held. Never before, perhaps, has the price situation been so vital a factor in national shows.

TO THE public generally the question of what the 1922 cars are going to cost is of equal or greater importance than the mechanism and design of the cars themselves. There is a tacit and well-founded recognition that the well-known and standard American cars are good cars. They have a reputation to maintain. In the much keener competition for business upon which the

automobile industry as a whole is entering this year, engineering faults in the new models would speedily destroy the good will built up through years of earnest effort.

Manufacturers are looking forward to a satisfactory selling year as a result of the shows. To meet this prospective demand a considerably larger output than in 1921 has been planned for many of the more popular and moderate priced types. Price stabilization will sell these cars if anything will. Surely no one doubts the frequent price changes last year had a disturbing effect.

From the viewpoint of the engineer the chassis seen at the New York-Chicago shows were far in advance of those displayed at former exhibits, and the same thing holds true with regard to body design and finish—all of which when considered in connection with the lowered prices means that the product of 1922 offers more real value to the buyer than ever before.

Innovations, while noticeable, do not predominate, and the forward steps most in evidence would better be spoken of as refinements, rather than any tendency toward the unusual, this applying alike to body and chassis. Power plants are more accessible and economical in the new cars, and greater attention has been paid to mechanical details. Bodies are hung lower, in nearly every case following the principle

adopted by a few builders last year whose conviction that this arrangement would tend to eliminate side-sway seems to have been proven. By far the majority of cars seen at the show had polished piston heads. It has long been known that carbon or soot will not readily adhere to a polished surface, and while it is somewhat more expensive to finish pistons in this manner, it is worth while



Alfred Reeves, General Manager National Automobile Chamber of Commerce.



S. A. Miles, Manager 1922 National Automobile Shows, New York-Chicago.



Simple, Tastefully Arranged Decorations Featured the National Shows.

because of the better performance of the engine and the resultant satisfaction of the car owner.

There appears to be a tendency toward the installation of the foot or service brake on the rear wheels, and the hand brake on the transmission or propeller shaft, if one may judge from the cars exhibited. This has the advantage of providing two absolutely independent brake drums, so that in case one breaks it does not affect the other, and, furthermore, puts into the hands of the driver a very powerful emergency braking system. Because of the location on the propeller shaft, the brake has the benefit of the reduction through the rear driving system and also of the equalization secured by the differential gears.

The propeller brake, however, has its disadvantages. Those most frequently cited against it are the tendency to chatter, the excessive stress which must be imparted to the universal joints and rear axle parts, and also the difficulty of dissipating the tremendous amount of heat absorbed by the small brake drum. Naturally the size of the brake drum is limited because of the location of the propeller shaft immediately under the floorboards of the car. In spite of these objections, however, by properly designing the brake, it has been found to give very satisfactory use.

Oiling Improved.

Several engine makers are locating the

oil leads on the exterior of the engine and attaching the tubes with a rise and fall in them to take up any variations. Haynes is a good example of this, as is also the new Mitchell engine. In the latter case the rise and fall serves another purpose. There is a drain at each T where connections are made to the main bearings and a plug can be removed from any drain to affect the oil in that particular lead only.

More attention seems to be given to the oiling of the valve mechanism of overhead valve engines. With pressure feed it becomes relatively easy to run a lead into the end of the rocker tube, or shaft which supports the rocker arms. These arms in some cases are made with openings in them to carry the oil out to the ball end, where the latter communicates with the socket in the top of the push rod.

Over-oiling has also been taken into consideration. The majority of pistons now have some means for taking care of any excess oil which might get into the cylinder walls. Sometimes this is done by fitting a scraper ring at the bottom of the piston, and in other instances the rings have been chamfered on the upper edges, but left sharp at the bottom to scrape the oil down on the walls. Hudson and Essex both have a ring designed to prevent oil getting into the combustion chamber. The rings are fitted to within .005 inch on the top and bot-

tom of the ring lands which are burnished, but left with plenty of clearance behind the ring. Some pistons are made to slide easier in the bores by drilling holes circumferentially around the piston to relieve the pressure of the intake stroke. This feature is especially desirable in lightweight pistons and in so-called high-speed engines.

Semi-Steel Pistons Light.

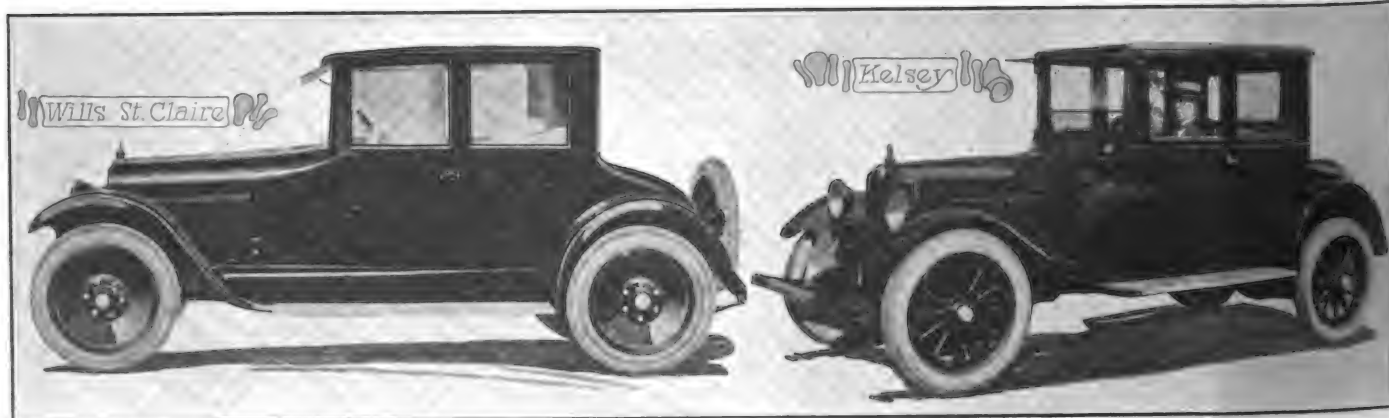
Where iron or semi-steel pistons are used there has been a tendency to get them very light. In fact, some of the semi-steel pistons weigh little more than aluminum alloy pistons. Indeed, it is possible to take some of the lightweight iron pistons and squeeze them into an egg shape by hand. Flexible pistons like this have the advantage that they will shape themselves into the cylinder bores in which they are working. In other words, the pistons will conform much better to the shape of the cylinder, doing away with possibility of wear.

Favor Disc and Plate Clutches.

Trend in design of clutches shows a continued advance toward the disc and plate types. The cone clutch in 1912 was used on more cars than all other types combined, being on 52 per cent. of the models. It has shown a constantly decreasing percentage until in 1921 it reached 8 per cent. and in 1922 has dropped to 6 per cent. The new cars have 73 per cent. of the models with disk clutches and 21 per cent. with plate clutches. These include both dry and oil types.

In changing from one gear to the next higher, the clutch shift, while it is in engagement with the engine, will be operating at a higher speed than the propeller shaft due to the gears in the gear set. When the clutch is disengaged and the gear shift lever thrown into neutral, the clutch shaft with its own spider will continue to spin at the engine speed, while the gear ratio is changed by changing into a higher gear. Unless the clutch shaft speed is reduced approximately to the speed at which the next gear is revolving at the time, there will be a clash of gears at the time of engagement with consequent damage to the face of the gears and annoyance to the driver.

The clutch brake will overcome this to a considerable extent if it is properly fastened and proportioned. The clutch brake operates automatically, reducing



Willis St. Claire, the "Mo-l-yb-denum" Car and the Friction Drive Kelsey. Both Attracted Favorable Attention.

the speed as soon as the clutch is released. It is operated by bringing a friction surface, such as fiber, against some part of the spinning spider or collar on the rear end of the clutch shaft.

Trend Toward Four-Cylinder Type.

A year ago it seemed as though there would be a definite trend toward straight-eight engines and four-wheel brakes, but these trends have not developed as expected. It is now doubtful whether straight-eight engines will ever come in for the attention that it was thought they would receive, but the adoption of four-wheel brakes is a certainty, although their immediate use seems further off than a year ago. Four-cylinder engines have increased in popularity and overhead valves are being more generally used on new designs. Carburetors and exhaust heated intake passages have improved, giving more power and greater economy and reducing crank case dilution.

A Car for Every Purse.

In the collection of cars exhibited there was a range of prices from a few hundred dollars up to more than \$11,000 for a chassis alone, with several cars approaching that figure for complete car, including closed body, so that whatever a man's taste and pocketbook may be there is bound to be found a choice within his range of desire and purchasing power.

Judged by present standards, the writer failed to find a single glaring example of faulty design or workmanship among the many cars examined closely, and it is evident that the industry is fast approaching the zenith of its remarkable career.

Lack of space forbids a complete, analytical description of all the automobiles exhibited, but the following were specifically noted because of certain new or unusual features:

ANDERSON.

Always distinctive in body design and original conception, the Anderson presented a fine variety of bodies built on one chassis of 120-inch wheelbase and using the new Continental Red Seal Model 7-R-6-cylinder L-head type motor, developing 55 horsepower. Some of the units included Borg & Beck clutch, Durstan transmission, Salisbury rear axle, Hotchkiss drive, Rayfield carburetor and Remy ignition.



Graceful Clean-Cut Lines Characterize the Car Offerings of 1922.

AMBASSADOR.

The Ambassador is a new and luxurious six-cylinder car, with a $3\frac{1}{2} \times 5\frac{1}{4}$ Continental engine. It is manufactured by the Yellow Cab Mfg. Co., a well-known taxicab maker of Chicago.

APPERSON.

Apperson Brothers continues its policy of not designing a product by yearly models. The models this year, however, were known as Apperson-Beverly models, taking the name from a continuous running record made at Beverly-Hills, Calif. All are powered with the famous Apperson-designed and built eight-cylinder motor and many refinements have been added.

AUBURN.

The Auburn is made in one chassis size of 121-inch wheelbase and is furnished in a new sport five and seven-passenger touring, two-passenger roadster, sedan and coupe body types. Some important changes were noted in 1922 series, notable among them being the use of the latest type of Red Seal four-inch bearing crankshaft, six-cylinder Continental motor. The doors are extra wide and the body is better built throughout. It is mounted on brackets fastened to a frame pressed out of steel, with deep sections and wide flanges, braced with five cross members.

BOURNONVILLE.

The Bournonville was interesting be-

cause it had a carefully developed rotary valve motor, of an entirely new design. The present car marked the culmination of 10 years of experiment. Its designer, Eugene Bournonville, is noted as one of the fathers of oxy-acetylene welding.

BUICK.

A popular model not seen at last year's show is the four-cylinder Buick, which closely resembles the six. It has a wheelbase of 109 inches. The engine has a bore of $3\frac{1}{2}$ inches and a stroke of $4\frac{1}{4}$, and is said to develop 35 to 40 horsepower.

CADILLAC.

The Cadillac is lower, more attractive, easier riding and more powerful. The radiator is higher and a trifle narrower. The low appearance is partly due to the use of 33x5-inch tires. Two new body styles have been added, coupes for two and five passengers, respectively. Mechanical refinements include a two-inch carburetor of new design, which automatically adjusts itself to temperature changes.

CASE.

A new Case six, known as the Model X, is low, only 74 inches high, with the top raised. The wheelbase is 122 inches and 32-inch wheels are used. This model is furnished in two body types, a five-passenger touring and five-passenger sedan.



Liberty Offers a Snappy New Roadster. The Rickenbacker Seen at Right Was One of the New Ones.

The Case Continental engine develops 55 horsepower at 2600 revolutions per minute. Road clearance has not been sacrificed in securing lowness, as a full 9½-inch clearance is maintained at the front.

CHANDLER.

Chandler Six for 1922 appeared in an entirely new series of bodies and has a rugged indestructible, noiseless, new rear axle with rigidly mounted differential and over-size taper roller bearings, a deeper channelled frame, soundly-bound cross members and strongly reinforced motor base, appeared among the betterments.

CHEVROLET.

Chevrolet continues to be made in two chassis sizes, the 490, with 102-inch wheelbase, and the F-B model, with 110-inch wheelbase. On both chassis are mounted touring, roadster, sedan and coupe bodies. The body is low, strongly built and well balanced. Improvements on the 490 included a new rear axle, with spiral bevel ring gear pinion; a new emergency brake lever, convenient to driver's reach, taking the place of the former emergency brake on right foot pedal; a new system of engine and transmission assembly; a new type of hub cap; redesigned springs; shorter steering column; larger gasoline tank; improved one-man top; stronger front axle and steering knuckle arms.

CLEVELAND.

The entire series of 1922 Cleveland bodies gave the impression of re-design, owing to radical changes in fenders, lamps, steps and additions of cowl lights. The car is more impressive and suggests the product of an European factory. Independent, full round, moulded fenders are held rigidly by strong brackets and cross braces and tipped with leather splashers. Headlights are of the barrel-type, nickelled and equipped with non-glare lenses, adjustable by ball and socket joints. Miniature lights of corresponding type appeared on the cowl.

COLE.

In addition to bringing out the new Series 890 Cole Aero-Eight, there were



Charles Clifton, President National Automobile Chamber of Commerce.

also shown for the first time two new models, comprising a full sized commodious coupe and a five-passenger suburban. An important chassis improvement is the new inverted braking system, from which remarkable results are claimed to have been attained. Other changes include a redesigned aluminum piston of the constant clearance type. Thermostats are incorporated in the cooling system and the oil pump design is changed. The clutch is newly designed and is fitted with a clutch brake.

CROW-ELKHART.

The Crow-Elkhart has a new sport type touring car added to the regular line, and this followed very closely along the line of the standard model, except that the equipment is more complete. Columbia axles are standard on all models.

DODGE BROS.

The center of interest in Dodge Brothers' display was the new coupe and sedan models, announced a few weeks ago, which are distinguished by their at-

tractive lines, fine finish and disc wheels as standard equipment.

DORRIS.

The Dorris, a large six-cylinder car of the luxury class, has a most interesting mechanical feature, which consists of a device attached to the intake manifold, called a distillator, designed to prevent the inspiration of liquid fuel by the engine. The manifold is so designed that there is a pocket just below the point where the gas enters each cylinder and any liquid fuel on its way to the cylinder fails to make the sharp turn into the cylinder and thus falls into the pocket, whence it flows through a small pipe to a central ercoir, which is heated from the exhaust.

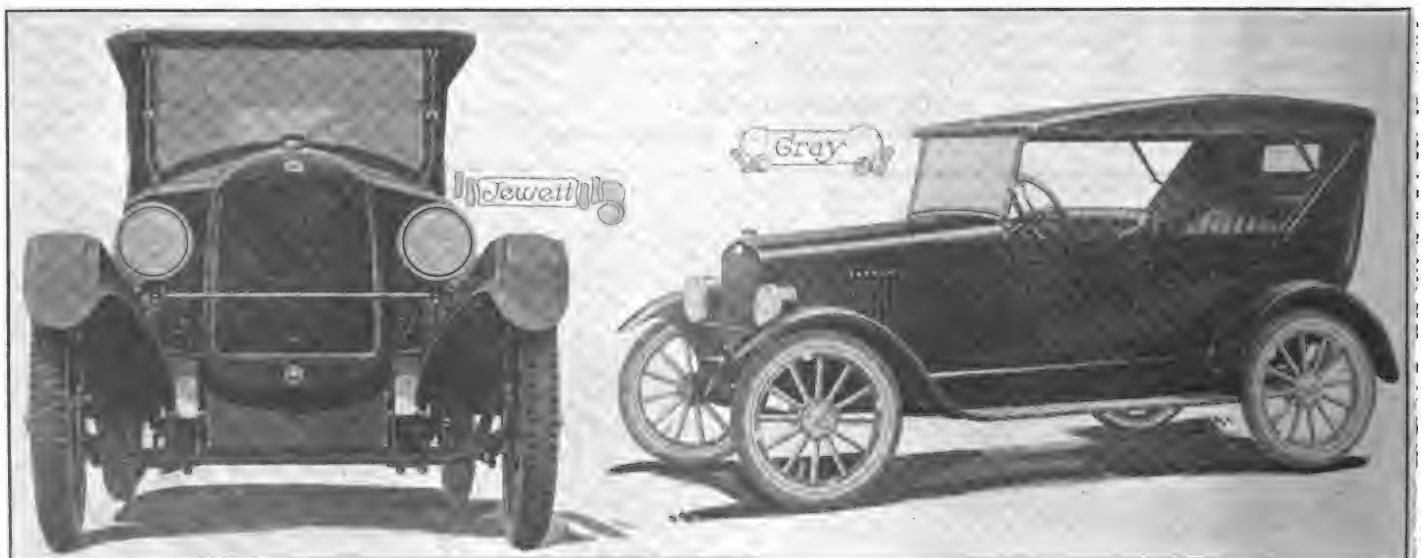
DORT.

In the Dort exhibits were two new types, brought out for the first time with the object of providing a medium-priced closed car. One is a well designed two-passenger coupe and the other a graceful five-passenger sedan.

DURANT.

The Durant car in both four-cylinder and six-cylinder models lived up to its optimistic forecast and show-goers were evidently greatly impressed with this latest product of W. C. Durant, regarded by him as his greatest achievement in his 35 years' experience as the successful builder of more than 2,000,000 motor cars. The four-cylinder model has 109-inch wheelbase and is furnished in touring, sedan and coupe body types. It is made at Lansing, Mich. The six-cylinder model, made at Muncie, Ind., has 123½-inch wheelbase and is furnished in touring, roadster, coupe and sedan types.

The four uses an overhead valve type of motor of special design, fully encased, with 3⅞-inch bore and 4¼-inch stroke. The pistons are removable through the bottom of the cylinder block, and there is no piping or attachments in the underpan, and the valve mechanism is extremely quiet. It is equipped with starting and lighting system, all wiring being encased in flexible metallic tubing. One important feature of construction is the rigidity of the chassis frame.



Paige Line Is Completed by the Jewett, a Six-Cylinder Model. At Right Is Seen the Gray, Also a Newcomer.

EARL.

The new Earl car represented is one of the new cars of the year. It was much heralded by preliminary announcements, and more than lived up to the expectations aroused, being always surrounded by a crowd throughout the week. Its makers announced it as a happy combination of beauty and utility, coupled with mechanical excellence of design. The lines are low and racy, but the seats are luxuriously comfortable, excellent vision being afforded from the rear seats. The chassis length is 112 inches. The motor is four-cylinder cast in single block, of the L-head type, and mounted with four-pointed flexible suspension. The bore is 3 7/16 inches and the stroke 5 1/4 inches. All of the gears are mounted at the front of the motor and are easily accessible.

ELGIN.

An entirely new model exhibited by the Elgin Motor Car Corporation came as a surprise. This car, which embodies numerous advanced engineering features, has been so closely guarded in its development during the last two years that only

have 132-inch wheelbase. The engine is of Fox exclusive design, six-cylinder and unit power plant, valve-in-head, with machined vertical fins for quick heat radiation. The bore is 3 1/4 inches and stroke five inches. The Fox air cooling system is unique in that the air is forced from the front by a Sirocco type fan, through an aluminum housing, across cylinder heads and down over the vertical cylinder fins. A motometer indicates the engine's temperature. Some other mechanical features include Fox exclusive design, selective type transmission; thief proof lock; Borg & Beck clutch, Hotchkiss drive; Spicer universal joints, Fox designed axles, rear semi-floating; spiral bevel gears, Timken roller bearings throughout, frame of Molybdenum steel, heat-treated; semi-elliptical Rowland front springs, 45 inches, rear, same make, underslung, 60 inches long; wire, wooden or disc wheels, 32 by 4 1/2 inch cord tires. The bodies are aluminum with genuine leather upholstery. The equipment includes combination Waltham speedometer and clock, power tire pump and Watson stabilizers.

guished this year, not only because of the change and refinements which have been added to the new 1922 line, but also because there are new Handley-Knight cars that were seen for the first time. These are the four-passenger, sedan-coupe, a five-passenger touring, which was especially built to satisfy a popular demand, and the seven-passenger de luxe touring.

HUDSON.

The Hudson super-six has been somewhat changed, although its appearance has not been altered much. The driver's compartment has been redesigned to provide easier steering and better pedal and control lever action. New fenders are used, and some body fittings have been improved. Internally there are several changes. The engine is now equipped with a manifold, which pre-heats the air to the carburetor.

HUPMOBILE.

Hupmobile, one of the pioneer fours, and still a four, comes in five-passenger touring, two-passenger roadster, five-passenger four-door sedan and four-passen-



Committee Members, 1922 Shows—Left, J. Walter Drake; Center, Chairman H. M. Jewett; Right, F. C. Chandler.

a few men, even in the organization, had known of its existence. The new models on display at the show attracted considerable interest among the motoring public, as well as among those in the trade. The new motor design embodies circulating pressure feed lubrication, oil pressure being regulated by a patented vacuum control. Oil is pumped through a hollow crankshaft, as well as through the rocker arm shafts operating the valves.

ESSEX.

The new Essex has a redesigned cylinder head and new pistons, and a hot spot manifold aids in the vaporization of the fuel. A new muffler has been fitted, and the springs have been redesigned. The standard finish is now blue instead of green, as formerly.

FOX.

The new Fox air-cooled car was shown in four models, five-passenger touring, five-passenger sedan, four-passenger coupe and a stripped chassis. All models

FRANKLIN.

Among the major changes incorporated in the Franklin during the past year are the case-hardened crankshaft, long type pistons and improved cold weather starting system, more efficient brakes and a new style hood. The case hardened crankshaft is said to be an exclusive car achievement with Franklin.

GRANT.

The Grant is made in one six-cylinder model on a 116-inch wheelbase chassis, using a Walker motor of 3 1/2-inch bore and 4 1/2-inch stroke. It is produced in four body styles, including two-passenger roadster; five-passenger touring, a coupe and sedan. The mechanical features include many well-known mechanical units.

HANDLEY-KNIGHT.

Always a notable exhibit at all automobile shows because of the high quality appearance of the car, the Handley-Knight display was especially distin-

ger coupe types this year. The wheelbase of the one chassis used for all bodies is 112 inches. The cylinders have 3 1/4-inch bore and 5 1/2-inch stroke. Conservative in design the bodies are nevertheless quite up-to-date and finished for serviceability rather than ultra smartness.

ITALA.

As its name suggests the Itala is manufactured in Italy. For some years previous to the war a few models were imported each year, but it is several years since a new Itala model has been seen in this country. The latest design is equipped with a four-cylinder high efficiency engine of L-head design. The bore is 3.27 inches and the stroke 5.12 inches. In common with all Italian chassis the Itala is a model of neatness and suggests a fine piece of sculpture.

JORDAN.

The Jordan M X shows important changes in both the chassis and bodies.

The motor of the new series is six-cylinder and used exclusively in Jordan cars. It is of the L-head, 3 5/16-inch bore and 4 1/4-inch stroke, and chains are used in the front end, contributing to silent operation. The new clutch with positive means of lubrication and of lightness obtained by elimination of the former large clutch hub, permits unusual simplicity and ease of operation. The electrical units are of latest Delco design. The rear axle is of a new Timken design and has an improved braking system.

KELSEY.

The Kelsey is extremely interesting because it is the first car equipped with friction drive, to be seen in this country for years. The friction drive mechanism is unique in that it is contained in the rear axle housing, the wheels being driven by an internal gear arrangement, similar to that used on many trucks. It is said that all the usual objections to friction drive have been overcome in this design. The car is extremely simple and easy to operate because it has no clutch or transmission. Starting and stopping and speed variation are obtained by moving the friction wheel along the surface.

LAFAYETTE.

The Lafayette erects touring, torpedo, roadster, coupe, sedan and limousine on one chassis, with 132-inch wheelbase, width 68 inches and height 74 1/2 inches to 78. The bodies are regarded as about the last word in design, beauty and finish, the open cars being upholstered in high-grade, hand-buffed leather in plaits over Marshall springs. The closed cars offer an option of mohair velvet pattern. Wide selection of colors is also found in the various bodies from Brewster Green, Coach Blue, Liberty Blue, etc. The engine is eight-cylinder, V-shape, developing more than 130 horsepower. The cylinders are 3 1/4-inch bore by 5 1/4-inch stroke, cast in blocks of four, cylinder heads being removable. A five-bearing crankshaft, 2 1/4 inches in diameter, is used.

LEACH-BILTWELL.

A fast, luxurious car, hailing from Los

Angeles, is the Leach-Biltwell. It is equipped with a six-cylinder, 3 3/4 by 5 1/4 engine, with overhead valve and overhead camshaft, which develops more than 100 horsepower. It is made of the finest materials throughout and is mechanically and aesthetically satisfactory.

LEXINGTON.

The new Lexington models, using the famous Ansted engine and representing everything from racy types to sedan or limousine comfort, were a center of interest at the show. The latest Lexington models are the Ultimate, a five-passenger touring car, and the Lark.

LINCOLN.

Lincoln, the Leland-built car, continues its one chassis design with 130-inch wheelbase for all shorter bodies, and 136-inch wheelbase chassis for longer types, both using the V-type eight-cylinder motor, in blocks of four at 60 degrees. The power plant is regarded as a model of clean design, a characteristic notable throughout the chassis in which accessibility of parts has been a distinctive aim. The bodies include seven-passenger touring, seven-passenger touring with permanent top; four-passenger phaeton, three-passenger roadster, two-passenger roadster, four-passenger coupe, four and five-passenger sedans and seven-passenger town car.

LOCOMOBILE.

As one of the pioneer American cars now in its 23rd year, Locomobile is low built, yet with ample road clearance. Body types in all conceivable styles from a gunboat roadster to the last word in landaulets and limousines are provided, finished and upholstered to the finest degree of workmanship and quality of material.

MARMON.

The Marmon showed four new models, which were a four, a seven-passenger sedan, a four-passenger coupe and a seven-passenger suburban car. The four-passenger sedan has four doors.

MAXWELL.

The 1922 Maxwell is sturdier, better

looking and certainly more comfortable than in other years. Thirty-one by four-inch cord tires are standard and real leather upholstery is used.

MITCHELL.

The Mitchell company was represented by a model which possesses an entirely new engine. High economy and pulling power at low speed are the features claimed for the new design.

NASH.

Many refinements have been made to the Nash six and four-cylinder chassis, and a new and revised line of bodies has been mounted, on both. The six-cylinder power plant has not been altered fundamentally, but there has been a number of changes which effect the handling of the fuel and the auxiliary units, such as the fan and electrical equipment.

OAKLAND.

The new Oakland 6-44 models are decidedly different. The five models have distinctly new body lines. A higher radiator, hood and cowl, together with noticeable body refinements, give a smartness and appearance of power. Numerous improvements have been incorporated in engine and chassis construction. The Oakland 6-44 engine is of the six-cylinder overhead valve type and it possesses many refinements and improvements.

OVERLAND.

The Overland, the smaller car, made by John N. Willys, presented several minor refinements this season. Mounted on the 100-inch wheelbase, the Overland sedan is a remarkably compact and comfortable little car, and it is one of the several makes in the show selling well under \$1000.

PAIGE.

The new Jewett car, close kin to the regular Paige models, and named after H. M. Jewett, president of the company, was disclosed as a complete five-passenger touring car, six-cylinder model, mounted on a 114-inch wheelbase chassis. The price will be less than \$1100 for open models and less than \$1700 for the sedan. Production is promised within two months.

PATERSON.

In accordance with their former policy, the manufacturer of the Paterson Six is producing only one chassis model of 120-inch wheelbase, and mounting it with a touring body for five or seven passengers, a sedan and a coupe. The passenger car is furnished with or without the disappearing auxiliary seats.

R. & V. KNIGHT.

R. & V. Knight cars which show certain refinements, use the Knight sleeve valve motor, the Model J in six-cylinder with 127-inch wheelbase and the Model R being four-cylinder. The larger car uses cylinders of 3 1/4-inch bore and 4 1/4-inch stroke, while the smaller car has 3 1/4-inch bore and five-inch stroke. Both models use Wagner ignition; full force feed lubrication through drilled crank shaft; thermo syphon cooling; Borg & Beck clutch and the V-shaped radiator. They are both equipped with electric starter. The six-cylinder model comes as



The Automobile Had to Show What It Could Accomplish in the Early Days.

a seven-passenger touring, four-passenger sport, two-passenger roadster, seven-passenger sedan and four-passenger coupe. **REO.**

The Reo, a six-cylinder car with 120-inch wheelbase, is provided in two-passenger roadster, a new seven-passenger touring, a new two-passenger coupe and a five-passenger sedan. The chassis has some distinctive features this year. The power and power transmission units (except rear axle) are carried in a sub-frame, saving the mechanism from vibration and road shocks. The one-lever control is also notable and claimed to be exclusive. Alemite lubrication system is employed.

RICKENBACKER.

Engine, rear axle and transmission of the new Rickenbacker are made in the Rickenbacker factory. The car is designed to sell for less than \$1500. The machine has a wheelbase of 117 inches, 32 by four-inch tires and a six cylinder engine of $3\frac{1}{2}$ by $4\frac{1}{4}$ inches. The car is noteworthy because of its power, speed and smooth running qualities. The engine develops 58 horsepower, which is unusual, considering the dimensions, and is capable of better than 63 miles an hour. An innovation found on the engine is the use of a flywheel on the front of the crankshaft, as well as on the rear. The dual flywheel gives smoother running.

ROAMER.

The Roamer is made in two chassis sizes—one of 128-inch wheelbase and one 218-inch wheelbase and is furnished in more than a dozen body types. It is also furnished with two different makes of motors, one of the four-cylinder Rochester-Duesenberg $4\frac{1}{4}$ -inch bore and six-inch stroke, rated at 75 horsepower, and the other the Continental Red Seal six-cylinder, 54 horsepower.

SAXON.

The Saxon-Duplex appeared with a complete line of open and closed bodies on one-sized chassis with 112-inch wheelbase. The body types included a roadster, five-passenger touring, a sedan and coupe. The motor is the overhead valve, four-cylinder type, $3\frac{1}{2}$ -inch and five-inch stroke, 35 horsepower actual brake test.

STEARNS-KNIGHT.

The Stearns is, a sleeve-valve Knight motored car, with four cylinders and develops 60 horsepower at 2400 revolutions. The chassis, which has a 125-inch wheelbase, is designed on high-grade engineering principles, the result of many years' experience. On this one chassis are mounted the following body types: three-passenger roadster, four-passenger Militaire, five-passenger touring, seven-passenger touring, coupe-brougham, sedan, coupe, limousine and landaulet.

STEPHENS.

The Stephens Six is a car of modish design in its latest offerings, being furnished in the following body types: four-passenger touring, two-passenger roadster, six-passenger touring, four-passenger sedan, seven-passenger sedan and an Artcraft top model. Individuality is apparent in every line. The chassis wheel-



General View of Madison Square Garden at Opening of First Auto Show in 1900.

base is 122 inches. The motor is six-cylinder of Stephens design, with overhead valves, the bore being $3\frac{1}{4}$ inches and stroke $4\frac{1}{4}$ inches.

TEMPLAR.

The Templar has added a new passenger car to its line, which has a wide door opening on the right-hand side, deck countersunk for a circular trunk, the latter being covered with the same material as the top. The top is modeled in accord with the contour of the body.

VAUXHALL.

The Vauxhall is an extremely high grade machine imported from England. Vauxhall is an old and well known name throughout the British empire, but this is the first time the car has been seen in America. The company has three models, all with four-cylinder engines. They are rated at 30-98 horsepower, 25 horsepower and 14 horsepower. The two latter list at 1100 and 750 pounds, respectively, with complete equipment, in England.

VELIE.

The new Velle is distinguished by a new six-cylinder engine, which is produced in the Velle factory. It has overhead valve and its design throughout is such as to render it more than usually silent, powerful and economical.

WESTCOTT.

The Westcott is built in two chassis types, the larger six, with 125-inch wheelbase and the smaller six with 120-inch wheelbase. Body types include five-passenger sedan, seven-passenger limousine-sedan, four-passenger coupe, seven-passenger touring, two-passenger roadster and five-passenger touring.

WILLYS-KNIGHT.

In the Willys-Knight exhibit were shown for the first time two new models, a seven-passenger touring car and a sedan, which are fine examples of well-designed coach work, roomy, but not bulky in appearance.

WILLS-SAINTE CLAIRE.

The Wills-Sainte Claire, featured as the "Mo-lyb-denum" car, because of the character of the steel used in its construction, is made in one chassis size of 121-inch wheelbase, with eight-cylinder, V-type motor using overhead valves and camshafts. The stroke is four-inch and the bore $3\frac{1}{4}$ -inch, and the brake test horsepower is 65. The car is unique in many respects in design, material and workmanship. Molybdenum steel is used in all parts of strain and stress, as frame, springs, shafts, rods and gears. The rear axle is semi-floating with ball bearings. Exceptional oiling facilities are afforded.

SPREAD COTTER PINS.

THE loss of a cotter pin from a unit of a car or truck may seem like a trivial matter, and in the ordinary sense it is. But serious accidents often have been traced to this cause. Cotter pins are used in chassis construction to perform a certain purpose, and if they are lost, the nuts which they are intended to retain may loosen with the jar and jolt of the machine, and work off, allowing the units to disassemble on the road.

Whenever units are fastened steel against steel as in the wheel spindles, steering tie rods or wishbone of the car, these units must be retained in such a manner that they will not work loose. Lock washers are used extensively between the fastening nut and the solid unit, but eventually these may work loose, if the nut itself is not further retained.

Castle nuts are used, having slots cut in the top of the hexagon nut and a hole is drilled through the threaded rod to which the nut is tightened until the opposite prongs of the nut register with the hole in the rod and the cotter pin is passed through and the points spread. Further loosening of the nut is prevented and the fastening stays tight.

Valve Tappet Adjustment

(By C. C. CALLAHAN, Sales Manager, The Parts Service Co.)

THE adjustment of valve tappets, particularly on those cars equipped with overhead valves, looks so easy that it is a constant temptation for tinkering, even though the tinkerer may not have a thorough understanding of all the conditions affecting proper valve and tappet adjustment. In order to clear up some of the less widely known conditions, and to bring out each item as a separate factor, the subject has been dealt with in the form of a questionnaire.

Q. Why are valve tappets adjusted with a clearance between the adjusting screw or rocker arm and the end of the valve stem?

Ans. Clearance is necessary between the valve stem and the rocker arm or adjusting screw so that when the cam rotates to the position where the valve is supposed to be closed, it is actually closed firmly and tightly by the valve spring.

WHAT should be the condition of the engine when clearance adjustments are made?

Ans. It should be warmed up to normal running conditions of temperature.

Q. Why should this precaution in regard to temperature be taken?

Ans. Because if adjustment is made when the engine is cold, the clearance usually will be something entirely different when it is hot. That is, the clearance may be too great or too little, or entirely eliminated, depending on engine design and whether the valves are in the head or on the side.

Q. What is the effect of too great a clearance?

Ans. The engine becomes noisy, that is, a "click" can be heard when the tappet screw or rocker arm hits the end of the stem, and the end of the valve stem is subjected to excessive wear and battering, due to the fact that the tappet face or roller has moved for some distance up on the steep part of the cam and thus the whole tappet is traveling at a much greater velocity at the time that the adjusting screw comes in contact with the end of the stem than it would be if the clearance were smaller and the tappet just starting on the steep part of the cam. Also, most cams are designed so that with a proper clearance the tappet screw or rocker arm hits the end of the valve stem at very low velocity, and consequently little noise. Again, with too great a clearance the valve opens late and closes early, because part of the operating surface of the cam is used in decreasing the excess space between the tappet and the valve stem without actually moving the valve, since, in most engines, the time of opening and closing of the valve is the result of very careful experiment so as to get the maximum power with smooth running, a change of timing such as the above will probably result in less power and not so smooth running.

Q. If results, as stated in previous answer, are correct, why not adjust so screw or rocker arm just touches the end of the stem?

Ans. This would make a very quiet running engine, but is not practical because

if adjustment is made when engine is hot, when it cools down the valves are liable to be held off their seats due to the difference in contraction of the cylinder, valve stem and tappet, and thus make starting difficult or impossible, due to loss of compression by leakage through the open valve. Further, there are always some inequalities in the cams, rollers and mechanism, so that at some points of the revolution of the cam shaft the valve may be held open when supposed to be closed. Again, with an adjustment of this sort the motor may run at a different temperature than that at which the adjustment was made, which temperature causes a different expansion of the length of the cylinder, the valve stems, the tappets, etc., resulting in the valve "riding."

Q. What is meant by "riding?"

Ans. This means that the valve is held off its seat by the end of the stem, being

PUMP PRECAUTIONS.

MOTORISTS who use a hand pump for inflating tires will do well to give the pump a few strokes of the plunger before attaching it to the tire valve. This blows out any grit or other foreign matter that may be clinging to the pump connection, preventing it entering the inner tube. It is also good policy to reverse the valve cap, using the small end to force the tire valve plunger open, allowing the pressure inside the tube to force out dust or other foreign matter from the top of the valve stem. This prevents its entrance into the tube when the pump is being used.

in contact with the tappet screw or rocker arm when the cam is in the position where the valve is supposed to be closed.

Q. Are there any other ill effects other than difficult starting, caused by "riding?"

Ans. Yes, several, if the adjustment is such that the valves close tightly enough for starting, but at normal running temperatures are held open. First, the timing of the valves is changed, opening earlier and closing later than intended, destroying the smoothness of the running of the motor. Second, the gas leaks out on the compression stroke, resulting in a weak explosion and initial pressure with loss of power. Third, gas leaks by, on the expansion stroke, with the loss of power. Fourth, if the motor runs comparatively cool and not up to its full capacity, there is a tendency for carbon to pile up on the valve seat and make a false seat, so that the opening around the valve will be closed by a ring of carbon and at light loads the engine will run quite well, but, if called upon to deliver maximum power for any considerable length of time, this carbon will be burned off, allowing a leak past the valve with its consequent loss of power and irregular running until the carbon false seat is built up again while running at light loads. Fifth, if the engine is one that runs hot, and is called upon for maximum power often or most of the time, the gases blowing by the valve seat on the expansion stroke are extremely hot and will eventually burn the valve head unless the valve is made of a material that is extremely resistant to their burning effect.

Q. What should be the clearance between tappet and valve?

Ans. No general rule can be laid down. It depends on design and peculiarities of each engine. The manufacturer usually has tested and experimented to find the correct clearance and his recommendation should be followed. It varies from .003 in. to .010 in.

Q. How can this clearance be measured?

Ans. By placing a piece of sheet metal, card board, business card or folded paper of the required thickness as measured by a pair of micrometers, between the end of the stem and the tappet screw and adjusting the screw until the inserted piece can be moved with just a little friction.

Q. Does the adjustment of a valve in the head differ from that in a T or L head?

Ans. Yes, usually a T or an L head can have less clearance than a valve in the head, because the distance from the top of the crank case to the seat of the valve, that is, the length of cylinder which expands by heat and contracts in cooling, is less in the T and L head than in the valve in the head.

Q. Just how does the length of the cylinder from the crank case to the valve

seat affect valve clearance?

Ans. The cam shaft is held by its bearings a certain fixed distance from the top of the crank case where the cylinders fit on. This distance is practically constant, because the temperature of the crank case does not increase very much. If it does, it only adds to what is said later. The valve is located in the cylinder casting a certain distance from the top of the crank case. Now, considering an L or a T head, when the engine is run until it is heated to its normal running temperature, the distance from the cam shaft to the top of the crank case is slightly increased, due to expansion from a rise in temperature. The cylinder has expanded from heat so that distance from the top of crank case to the valve seat is increased, so the total distance from the cam shaft to the valve seat is increased. This distance is spanned by the valve stem, whose length has been increased by heat, but not to such an extent as the corresponding length of cylinder, because it is made of steel which expands, less and, too, the temperatures are not so high; and by the tappet, which has expanded but slightly, due to its much lower temperature. Now, if the expansion of the cylinder and crank case were just equal to that of the valve stem and tappet, we could make the tappet adjustment cold or at any temperature and make it so that the tappet nearly touched the end of the valve stem and it would remain constant. Since, however, the total expansions of the two lines of connection of metal between the cam and the valve seat, namely, crank case plus cylinder and valve stem plus tappet, are different, we make the adjustment when hot and everything

is expanded and make the clearance such that when these parts cool down and contract by the same amount that they previously expanded, plus an amount to take care of wear and inequalities, the valves will be closed.

Since the two lines of metal in the valve in the head, namely, crank case plus cylinder casting and valve stem plus push rod plus tappet, are longer the total contraction, from the temperature of adjustment, will be greater—hence the clearance allowed must be more.

Q. Should the exhaust valves and the inlet valves have the same clearance?

Ans. No, the exhaust valves should have the greater clearance, because their stems become hotter and expand more. This assumes that the two valves are side by side.

Q. What is the effect, with reference to tappet clearance, if the end of the valve stem is not square?

Ans. The end of the valve stem and the top of the head of the tappet adjusting screw should both be square with their respective center lines, because, if they are not so and the adjustment is made correctly and then either is turned slightly about its own axis, the clearance will be changed in some cases so much that the valve will "ride." This is especially true if the tappet and valve stem are not exactly in line, and they seldom are.

Q. Why should the ends of the valve stem be hard?

Ans. Both the end of the valve stem and the head of the tappet screw should be hard to prevent wear, which would result in an increased clearance, and on the valve stem to prevent "burring" over of the edge around the end which makes

it difficult to remove the retainer washer from the end of the stem and also to remove the valve through the guide when it is desired to regrind.

Q. In overhauling an engine, is it O. K. to grind or file the end of the valve stem or the tappet screw head?

Ans. Generally not. Great care is exercised in the manufacture of valves and tappet screws as well as in threading the tappets to keep them square, concentric and in line within a very few thousandths. No man can file the end of the valve stem or the top of the head of the tappet screws within three or four times the accuracy required, and very few repair shops or garages are equipped to grind with such accuracy. Further, unless the valve is made from an alloy steel which hardens all the way through and is so hardened by the original manufacturer, the end of the stem will be left soft, resulting in rapid wear, since the common steels, such as used on 3½ per cent. nickel and C. I. head valves have the end hardened for a depth not exceeding .001 in.

Approximately 1200 American motor vehicles, valued at \$1,440,000, have accumulated on the wharves, in warehouses and in lots at Buenos Aires, because of the general freight congestion there.

Registration cards or certificates for 1922 for motorists in Pennsylvania will be printed on a five by three-inch card, that they may cut to fit the ordinary sized wallet.

In Algeria 11,000 automobiles are in common use between coast cities and also between mountain and desert settlements, competing favorably with train service both as to time and cost.

USES RADIO-EQUIPPED CAR

IT DOES not require an ultra-imaginative person to realize the possibilities of police cars, fire engines, or emergency cars with a simple, wireless apparatus which will transmit instantly messages from headquarters. To Edward Dallin, Harvard graduate and radio experimenter, goes the credit for a novel wireless device.

WHILE Dallin's equipment is for his own experimental purposes, it would be readily adaptable to purposes like those mentioned. The set, as invented, is simplicity itself. Two broom handles and a length of lamp cord form the antennae, a wooden box originally intended to contain milk chocolate, is the cabinet for the sending apparatus, and an ordinary spark coil supplies plate voltage for the vacuum tube transmitter. With this set Mr. Dallin can travel about in his car and in the vicinity of his home at Quincy Point, Mass., receives messages from points as far distant as Key West, Fla., and Savannah, Ga. His sending range averages 10 miles, and he is working now on a much more effective sending apparatus.

Dallin says it is a queer sensation to be driving comfortably along in his car and suddenly have the buzz-buzz of the box beside him begin to take rhythmical

the dash board. The inventor says he could construct one that will take considerably less room. "And some day they will be making them so small that we



Showing Manner in Which Wireless Set Is Installed in Automobile.

form in dots and dashes—which may be his call number, 1FK, or just the rambling message of some amateur operator.

The whole set, as it appears in Mr. Dallin's car, occupies only a few cubic feet of space between the front seat and

will have a vest-pocket wireless," he added with a laugh.

Mr. Dallin takes many long trips in a Dodge Brothers car, but he can keep all ways in close touch with events through his radio device.

The Stolen Car

*How Thief Operates—"Business" Highly Organized—
—Owners Frequently Unable to Identify Property—
Methods of Marking Automobile to Aid in Recovery*

IN every city in the United States of any size, cars are stolen daily by the "crooked gentry" who follow this line of least resistance in the endeavor to make a living at someone else's expense. New York alone reports from 50 to 75 cars stolen each day in the week, the number varying apparently according to the needs of the thieves and the ease with which the cars can be made off. In spite of the vigilance of the police departments and the insistent demand of insurance companies that this nuisance be abated, car thieving still persists and probably will as long as conditions

remain as they are and owners continue to carelessly leave their cars in such a manner that they can be easily stolen. Sometimes gun play enters into the procedure, but usually the thief works quietly, watching his chance to make off with the car when no one is watching, and in this he is usually successful. That the business is highly organized and is controlled by a master mind seems to have been proved many times. It has also been shown that persons one would least suspect are more or less interested in the traffic and come in for a share of the profits.

A RECENT example of car thievery is cited in the case of a young milk dealer, who recently purchased a new Buick touring car. He attended a dance, leaving his car locked safely, as he supposed, at the curb near by the building. When coming out to get his car he found that it had disappeared, and although it was insured no trace has been found of it up to date. Possibly it may turn up later, but its newness will be effaced, and its worth greatly depreciated. The question naturally arises, in this connection, how will he be able to identify his car if it is found. To be sure, it carries the factory engine number on the crank case of the engine and a frame number on the frame. These numbers are, however, usually changed by the car thief and his accomplices, so that the owner has a small chance of identifying his property by this method.

What other method can he depend on for positive identification?

Owners Unable to Identify.

Many owners claim that they are able to identify their cars by means of marks on the body finish, rips in the upholstery, special equipment on the dash, speedometer mileage, etc. But very often when they are confronted with them they find that the marks on which they are depending for identification are common to many others of the same make, and they cannot be certain if the one in question is theirs.

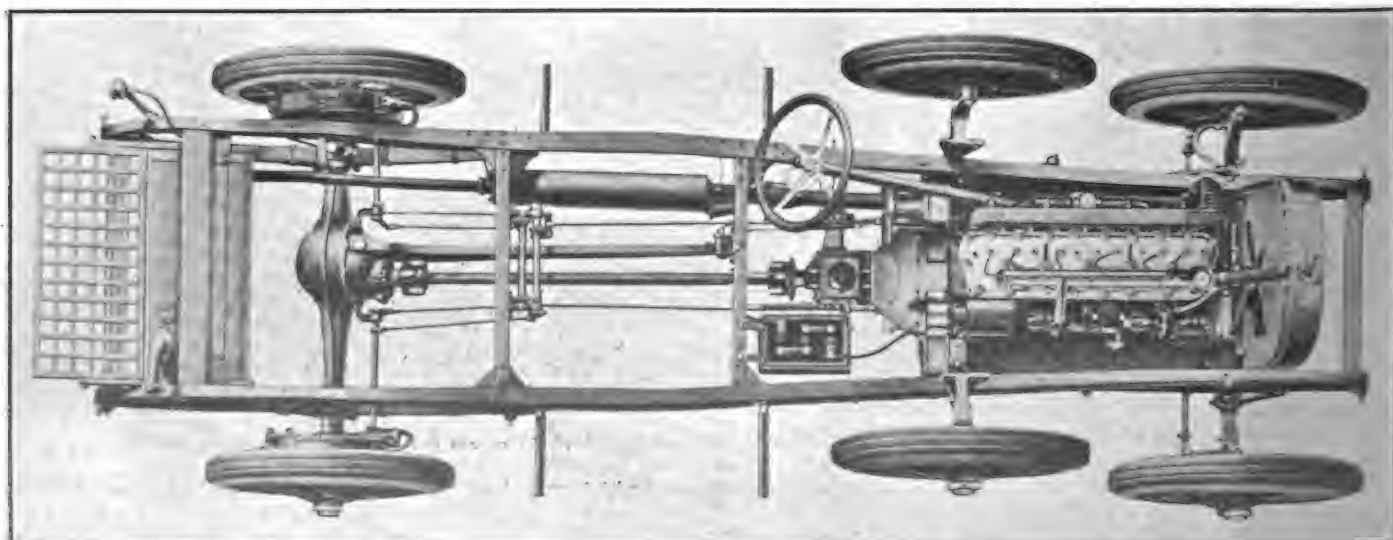
An instance is given where the police department of a certain city notified several owners that they had recovered cars which answered the description of cars stolen from them. The owners went to identify the cars, and in one particular instance six owners claimed the same machine, all positive that the car

was theirs from their marks of identification. Finally one of the young men told the police captain in charge to look on the underside of the left brake band and he would find his initials stamped on the band. Scraping away the new paint in the location indicated, the initials were found and the young man drove away with his car.

How to Mark Car.

The suggestion is made that to mark the car so that it can be positively identified, if stolen and recovered, one good method is to place on some portion of the chassis frame, or other inconspicuous place, the owners initials or some other distinguishing personal mark that is easily remembered and in a spot that, regardless of repainting operations, it will not be disturbed. The marks should be made

Bird's-Eye View of Haynes 75 Chassis



This Clean Cut Example of the Engineer's Art is the Culmination of the Efforts of a Group of Haynes Chassis Specialists and Represents the Cumulative Knowledge of More Than a Quarter Century of Service.

with a prick or steel punch forming the letters desired and struck sufficiently heavy so that nothing will efface them. Drilling a hole and filling it with lead in some part of the chassis frame may do the trick; a special stamped washer, placed behind an inaccessible nut will help in case of identification, and many other novel methods of marking will readily suggest themselves to owners when they realize that to foil the thief they must use as cunning methods as he does in stealing the cars.

To show how easily a thief may get away with a car, an instance is given of a person attending a church gathering during the daytime, leaving his car standing locked at the curb on a slight down grade. A car thief came along, saw the opportunity, jumped into the car, released the brake and allowed the car to coast to the bottom of the grade, where a repair shop was located. Hopping out of the car, whistling a bar of a hymn as though he had just come from the meeting, he asked the garage mechanic to unlock his switch, as he had lost his key while in church. The obliging mechanic did so and the thief went on his way with the stolen car.

Another young man was attending a lecture one night at a country grange hall. He left his car unlocked, feeling that surely there cars were safe from thieves. Imagine his surprise when he came out to start for home to find his car gone. The next day it was discovered several miles from the grange hall, in the edge of the swamp, with about everything removable taken from it.

Locks Sometimes Ineffective.

As soon as a new special lock is placed on the market and adopted by motorists, some of the gang of thieves find ways either to unlock it or to start the car without bothering with the lock. Locks of many kinds are displayed in the accessory stores, running through the tumbler type to special devices sounding an electric bell or a horn warning signal whenever the car is being tampered with while standing idle.

One chief reason why this guild of thieves can exist is no doubt the careless manner with which motorists leave their cars parked. There is no other piece of property that they own with which they are so careless when the amount of money invested is considered.

There is also the feeling among motorists that, as they are paying good money to the insurance companies to protect them against theft, if it does happen, to let the insurance companies settle and recover the stolen car while they are riding around in a new car. Co-operation with the insurance companies will help materially to lessen the possibility of theft, while a little more care in purchasing suitable locks or installing an efficient alarm system that will notify the police if some one tampers with the car while the owner is absent, will also help. Identification marks placed in inaccessible places about the frame will help greatly in claiming the car if it is stolen and re-

NON-BREAKABLE AUTO PREDICTED.

NON-BREAKABLE automobiles are assured with the success of the arms limitation conference, believes J. J. Cole, president of the Cole Motor Car Co. of Indianapolis.

"If the steel-treating experts of the world are relieved of their task of thinking exclusively in terms of armor plate and armor-piercing projectiles," says the manufacturer, "they will have time to help us build non-breakable automobiles. Certainly if they can make steel strong enough to withstand the impact of a six-inch shell they can make an automobile that won't break or bend if you drive it into a telephone pole, a tree or a concrete bridge.

"Steel-treating and metallurgics are only in their infancy. If the disarmament conference would enable us to build far better motor cars it would in time provide us with better steel to put into them. It would also give us better roads, because there would be more money to spend on roads if we quit wasting our national resources on armament."

covered. Lastly, the car owner should not tempt the car thief by leaving his car where it can be easily taken when he is not looking, and much can thus be accomplished towards reducing the possibility of car thefts.

Rarely Steal Chauffeur-Driven Car.

Chauffeur-driven cars are rarely stolen, as the driver usually has his eye on the car all the time that it is standing idle. However, the average owner cannot afford to hire a man to ride with him and watch the car, while it is standing, to prevent theft, and he must thus provide some other means to guard his car.

The Buick Motor Co. has devised a unique method for tracing stolen cars which might well be used by other companies. The method consists of informing all recent Buick owners, in case of theft, immediately to get in touch with the dealer from whom the car was purchased, giving him all available information possible. This should consist of chassis and engine numbers as well as marks by which the car may be identified.

This information is immediately forwarded by the dealer to the distributor or nearest factory branch under which he operates, the branch or distributor in turn passing the information to the factory department without delay.

Sending the information in this manner means that all of the correct data will be gathered before it reaches the factory and that no time is lost in securing additional knowledge of the case which the owner, if he wrote the factory direct, might fail to give. This system is not complicated and insures quick action.

VALVE GRINDING PRECAUTIONS FOR AMATEURS.

AN inexperienced mechanic may find when grinding valves that after working for a time he is not able to make the valve come down on to its seat as it should. Examination may disclose the fact that the end of the push rod is bearing hard on the end of the valve stem, preventing the valve from seating.

Before attempting to grind the valve make sure that the valve is on its seat and that there is sufficient clearance between the valve stem and push rod. Use a thin steel feeler to gauge this distance, as it may be easily pushed in between the two ends to show the amount of clearance. Turning the engine slowly, watching the valves, will often show the repairer when the valves of a cylinder are closed, while testing with the feeler will make this fact doubly sure.

Pieces of carbon are liable to slip off from the valve stem as the valve is withdrawn through the upper bushing, dropping on to the end of the push rod. If not blown off, the valve stem will crush the carbon when again inserted through the bushing and will cause it to compress into a hard spot, which also is apt to hold the valve from its seat. Blow this loose carbon away as soon as the valve is withdrawn, and this cannot occur.

In cleaning carbon from L-head engines having removable cover over the cylinders, the carbon is very apt to enter the bolt holes which take the cover bolts. To make sure that they are free from carbon, select a drill smaller than the bore of the bolt hole and drill out this carbon before the bolts are again forced home; otherwise the bolt ends bring up hard on this loose carbon, compressing it into a hard spot, preventing the bolts from entering to their full depth. Continued effort to make the bolt seat often twists off the bolt.

WARNING SIGNALS ARE RESTRICTED IN ROUEN.

Warning signals producing loud and harsh noises, such as are manufactured by some American concerns, are forbidden within the limits of the City of Rouen, France; only ordinary "bulb" horns may be used. This should not greatly affect the sale of American horns, as nearly every automobile carries both kinds and the restriction does not apply on country roads.

A FEW OF THE VARIOUS NEW MODELS THAT

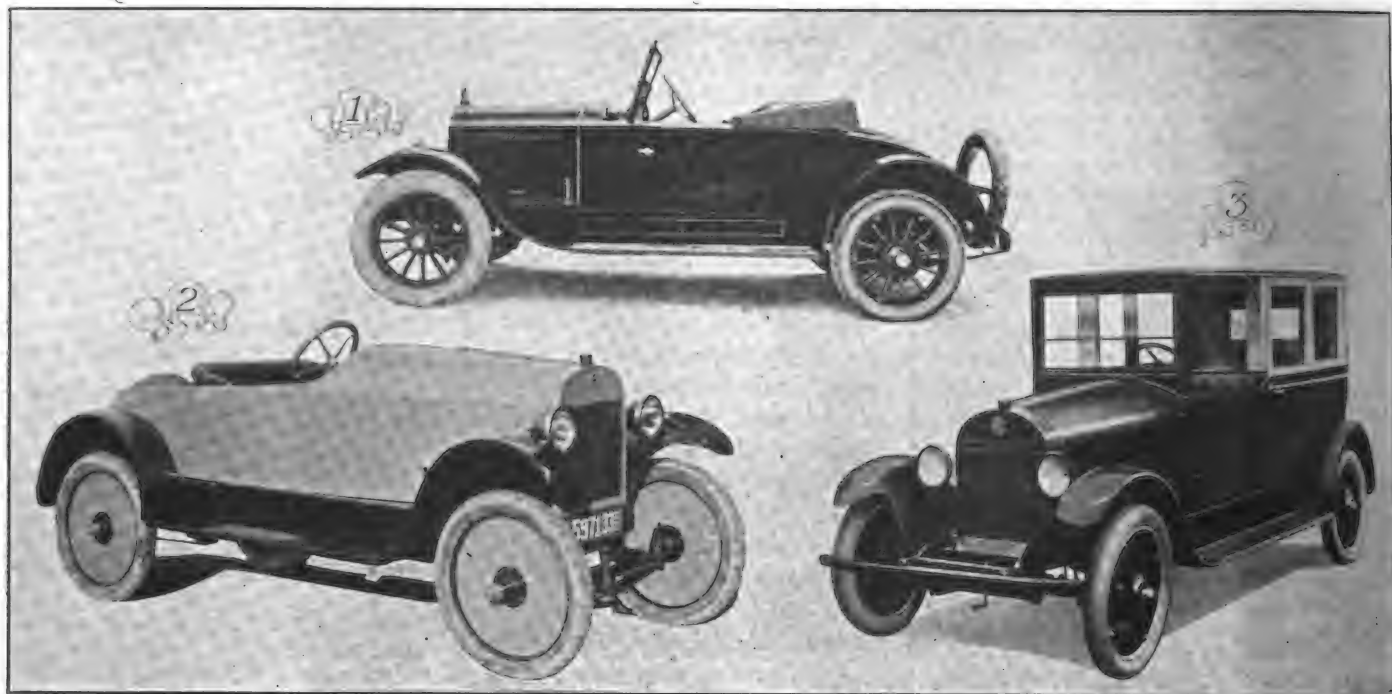


FIGURE 1—RANGER.

THE Ranger roadster is mounted on the model A-20-4 chassis, and is equipped with the Ranger-Supreme motor which proved its reliability in an endurance contest staged 12 months ago. The lines of the new bodies are extremely attractive, and, as in the case of touring cars, choice of eight color combination is offered the prospective purchaser.

The roadster has a large, roomy seat, wide doors, and upholstery; trimmings and coach work in general are in keeping with the splendid craftsmanship in which the Ranger designers and builders take such pride. Back of the seat, the body, sloping in graceful lines, allows space for an unusual roomy compartment, adding a utility feature which will be acceptable to the motorist.

This roadster is furnished in standard blue-black or Ranger maroon; also in a wide variety of colors, with nickel radiator and trimmings.

FIGURE 2—SUN.

THE Sun, manufactured by the Automotive Corporation, Toledo, O., is made in two-passenger style only. The car which sells around the \$300 mark has a wheelbase of 91 inches and is 122 inches overall. Disc wheels are standard equipment and the frame is of pressed steel with cantilever springs. The motor is of the four-cylinder, four-cycle, air-cooled type, with overhead valve construction. Bore and stroke are $2\frac{1}{2}$ by $3\frac{1}{2}$ inches. The motor has developed as high as 22 horsepower the manufacturer states, and turns up 3500 revolutions per minute. Forced feed lubrication with oil driven by gear pump is standard and non-gran bearings are used. The car is said to have a speed of 50 miles per hour.

The principle features of economy claimed for the Sun is the manufactur-

er's statement that 50 miles may be obtained per gallon. If this fact can be demonstrated to the satisfaction of the purchaser it is obvious that the car should attract attention, as it will be practically in a class by itself. No statement is made to account for this unusual mileage.

The weight of the car is given as 900 pounds when ready for shipment. The manufacturer in speaking of the new car says that it has been exhibited in Philadelphia, Newark, Boston, Buffalo and other cities, where it has aroused great interest.

FIGURE 3—WELL-BUILT.

THE chassis of the Well Built Taxicab is the standard Ford model "T," extended with pressed steel channels, reinforced with intermediate

and rear cross members. The extension members are riveted to the frame. This extension increases the wheelbase 15 inches. The drive shaft extension is entirely enclosed with a center bearing supported on frame cross member.

The wheels are equipped with demountable rims. The front tires are 31 by four plain tread, rear 31 by four non-skid tread. The wheels are provided with enamelled steel discs inside and outside. The outside discs are crowned, the inside discs flat. The inside discs incorporate a small door for tire inflation. A two-inch black enamelled steel channel bumper is attached to the front of the chassis.

The frame work is made of strictly first quality oak, ash and maple, so engineered and framed as to make the greatest strength with minimum weight.

All glass is selected, coach plate or crystal glass of the sashless type, operating in felt lined steel guide channels. The glass behind the driver is non-breakable wire plate. The drop sash is provided with lifts and fence. The top is solid matched roof covered with a thin wadding and high grade Pantesote roofing, with all edges concealed and covered with aluminum roof moulding.

FIGURE 4—ALLEN.

AMONG the popular cars for the 1922 season is mentioned the Allen 43.

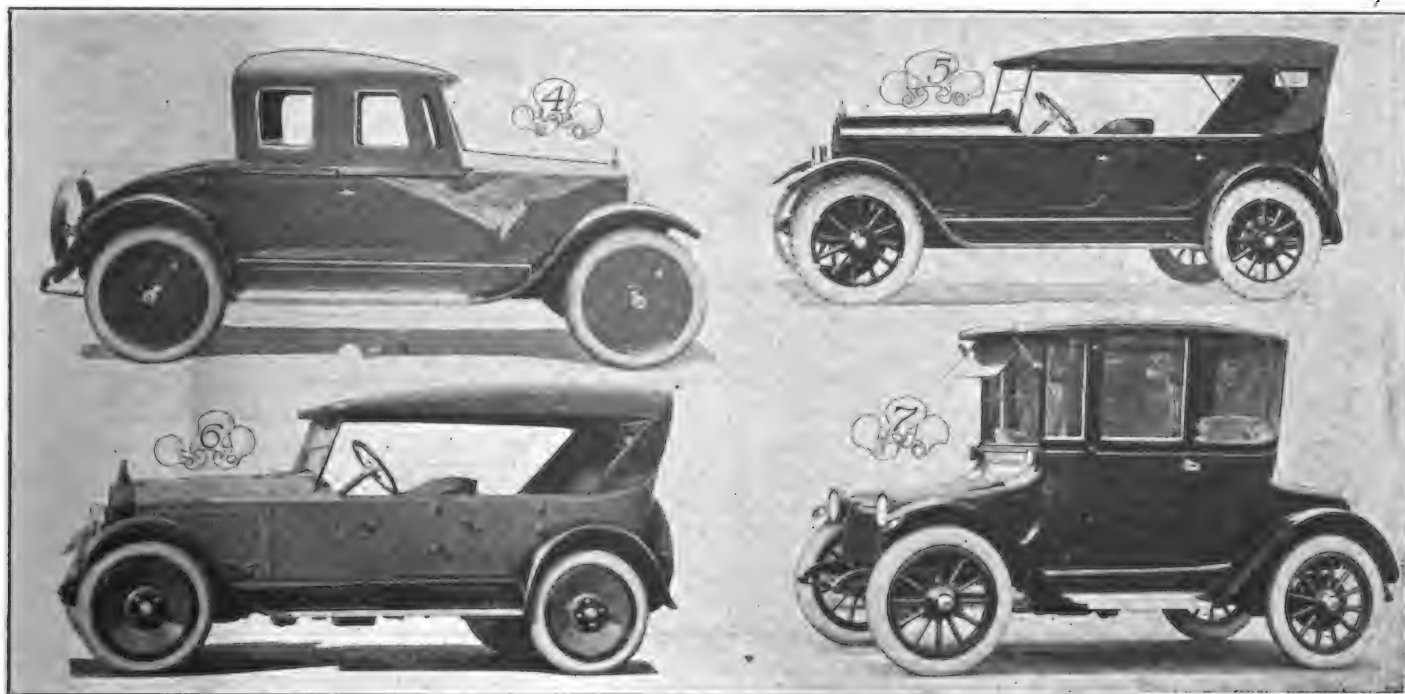
Many of the units used are said to be made in the Allen factory under the careful supervision of inspectors and workmen who give their best to make the Allen 43 a good car. Four models comprise the Allen 43 line for 1922, a five-passenger touring car, three-passenger roadster, Artcraft five-passenger touring car, Artcraft three-passenger roadster and five-passenger sedan.

The engine used is the Allen four-cylinder, L-head, vertical type, having a bore and stroke of $3\frac{1}{2}$ by five inches.

LUBRICATION FACTS.

LUBRICATION on a dirty surface is little better than no lubrication at all. For example, complaints about stiff operation of the brake and clutch pedal are frequent. This trouble can be cured by the application of a little oil at the joints, but the joints must first be cleaned before the oil is squirted on them. An oil hole will not feed lubricant if there is dirt at the bottom of it. Exposed oil holes should be first cleaned out before the oil is injected. Incidentally common sense is the best lubricant.

ARE OFFERED FOR THE SEASON OF 1922



The horsepower rating is 19.60 N. A. C. C., maximum brake horsepower 37, 192 cubic inches piston displacement. Pressure lubrication is used.

Cooling is by means of the thermosyphon system and a dry-disc clutch is used. Transmission is in unit with engine and is of the three-speed selective type. The front axle is a drop forged I-beam, the rear a Columbia three-quarter floating. Final gear reduction is 4.60 to one. The wheelbase is given as 110 inches and 32 by four-inch tires are used.

FIGURE 5—GARDNER.

THE Gardner is stated to be definitely designed for a world-wide field which demands a good car. Russell E. Gardner, president of the Gardner Motor Co., Inc., has been building vehicles for nearly half a century and they have always borne a reputation for quality it is stated.

The specifications of the Gardner are as follows: The engine is a Lycoming four-cylinder, L-head, vertical, with a bore and stroke of $3\frac{1}{2}$ by five inches and an N. A. C. C. rating of 19.60 horsepower, with maximum brake horsepower 35. Piston displacement is 192 cubic inches. Lubrication is by force and splash and the Westinghouse battery system of ignition is used.

Starting and lighting units are the Westinghouse two-unit system, and the improved Carter carburetor is used. The clutch is a Borg & Beck dry disc. Transmission is in unit with engine and clutch, three-speed selective. The rear axle is a Flint bevel gear drive, having a final reduction of 4.42 to one, with Hotchkiss drive. The wheelbase is 112 inches.

FIGURE 6—COLUMBIA.

THE DeLuxe touring model of the Columbia line is a thoroughly up-to-the-minute car in every respect, states the manufacturer. Mounted on

the Columbia's 115-inch wheelbase chassis, it has long body lines, deep-drawn crown fenders, a many-louvered hood and non-collapsible top. The upholstery is genuine leather and the top is pantasote.

Two other open models are included in the line, a roadster and a sport model. Two closed cars, a coupe and a sedan, complete the standard line, specifications of which follow:

Seven R Continental motor, Atwater-

KEEP WHEELS TIGHT.

DEEP watch of your wheels to see that they are not thrown out of alignment by road shocks, wear, running against curbing or other causes. The rear wheels should be absolutely parallel, but the front wheels toe in at the bottom and vary in width from $\frac{1}{4}$ to $\frac{3}{8}$ inch between centers of the tire front and rear. Train your eye by looking at the front wheels of different cars, and you will then notice any trouble when it occurs. Have the wheels aligned properly at the first opportunity as your tire mileage is sure to suffer otherwise. A front tire running out of line scuffs along the road and in a short time has the appearance of having been run against a buffing machine.

Kent ignition, Pres-o-Lite battery, Auto-Lite starter, motor and generator, Stromberg carburetor, Harrison radiator, Borg & Beck clutch, Spicer universal joints, Durston transmission, Gemmer steering, Timken front and rear axles, Detroit steel springs, Prudden wheels, Firestone or Goodrich cord tires, Boyce motorometer. In addition, the standard line is equipped with thermostatically controlled radiator shutters and non-synchronizing springs. The DeLuxe touring also is equipped with the Flometer.

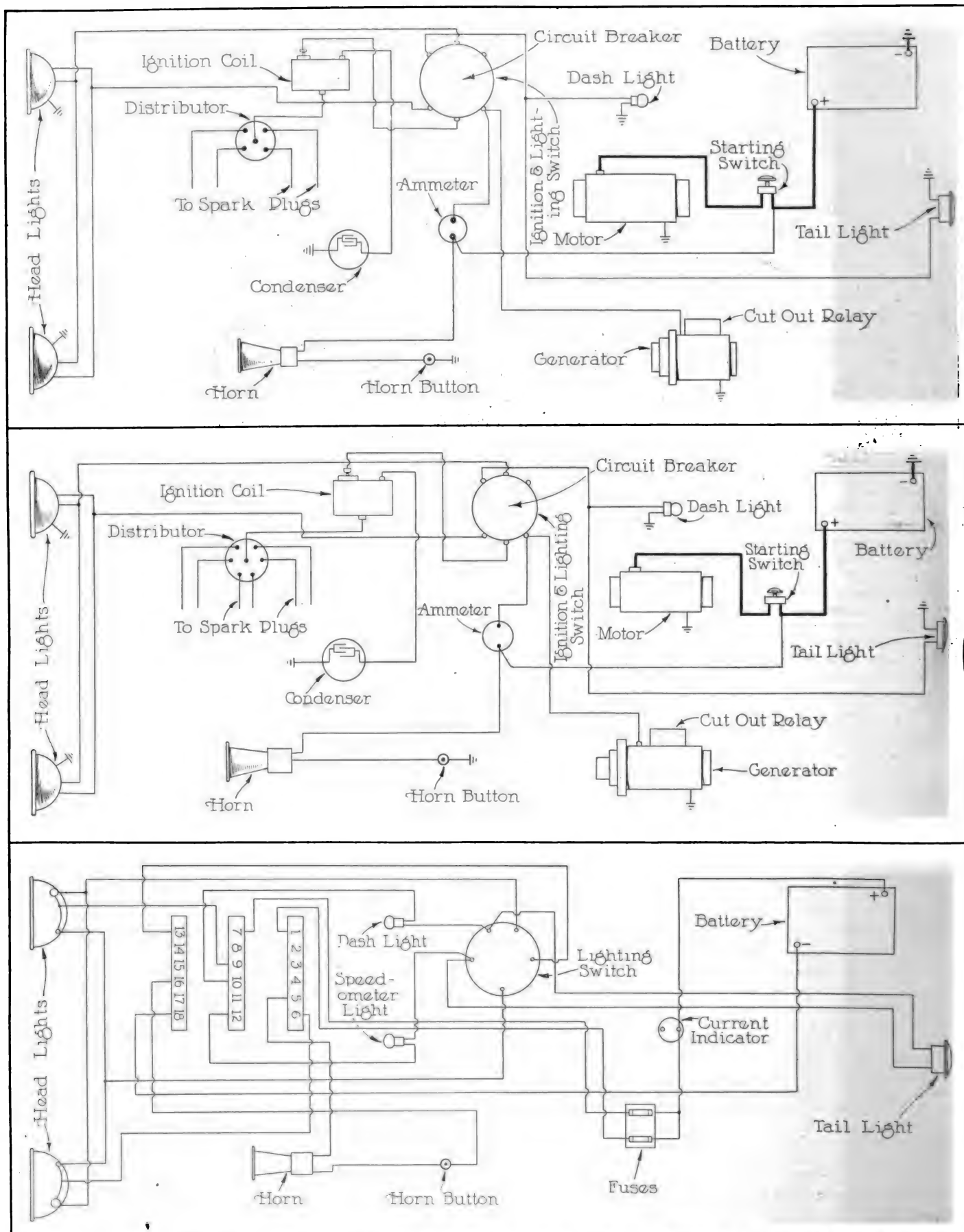
Besides the Challenger five-passenger touring, there are two other models in the Challenger line, a sedan and coupe. The three Challenger models are built on a 115-inch chassis on which are mounted substantial bodies differing slightly in style from the regular line. The Challenger has the Reutenber motor, Adams rear axles and is not equipped with automatically controlled radiator shutters. This line is said to be proving very attractive to the public because of its price.

FIGURE 7—DETROIT ELECTRIC.

THREE persons may ride comfortably on the rear seat of the Detroit Electric, while a fourth passenger may occupy the Pullman seat in the right front corner. A removable seat is placed in the left front corner to be used by a fifth person in an emergency.

In summer weather windows may be lowered, affording all the pleasures of an open car, yet because of the permanent top, occupants are protected from hot rays of the sun. In cold or inclement weather windows may be raised, affording complete protection against rain, snow or wind. Door windows are sashless and may be raised or lowered by patent window lifter. Rain drip protectors over the tops of the doors are provided.

Monthly Wiring Diagram, No. 24



Top—Crow-Elkhart 1921 Four-Cylinder, Dyneto Two-Unit System, Battery Ignition, Single Wire, Circuit Breaker in Lighting Switch. Center—Crow-Elkhart 1921 Six-Cylinder, Dyneto Two-Unit System, Battery Ignition, Single Wire Circuit Breaker in Lighting Switch. Bottom—Franklin 9-B 1921, Six-Cylinder, North-East One-Unit System with Atwater-Kent Ignition, Showing Light and Horn Circuits, Commonly Known as Two-Wire Return System.

Boston Show to Be Veritable "Pageant of Progress"

*Display Space Fully Allotted—Some Applicants
Turned Away—Salon to Be Held in
Ball Room of Copley-Plaza*

PREPARATIONS for the annual Boston Automobile Show which opens on March 11th for the usual one week, are rapidly nearing completion. When the first allotment of space was made by Manager Chester I. Campbell every foot of space in Mechanics' building was disposed of and there were some applicants who could not be accommodated. In addition to the show in Mechanics' building, it is the inten-

tion of the Boston Automobile Dealers' Association to have a salon for high-class cars in the ball room of the Copley-Plaza hotel, which will be open from Monday to Friday of show week.

The arrangements for the main show will be as usual. The motor cars will have all of the street floor of Mechanics' building and such space as they may require in the balcony.

THE remainder of the balcony will be devoted to accessories, while in the basement there will be the usual display of commercial motor vehicles.

One of the outstanding features of the 1922 show will be the great values in the cars displayed. Never before has a prospective automobile purchaser been offered the value he can now get. Ever since the war motor manufacturers have

been profiting by the lessons learned when the plants were being used by the government. As a result they have been able to reduce costs and at the same time show betterments in their products.

Automobiles surely are improving every year; the automobile shows reflect this. For the most part, however, the betterment has been noticed in body designs, coach work; finish both interior and exterior.

This year's exhibition will also show to the public the biggest display of accessories that has ever been located under one roof, in spite of the fact that it was impossible to find space for many who applied for booths. Every year something new can be depended upon from this phase of the exhibit, this branch of the trade having grown to vast proportions in the past few years and far reaching.

Approximately 40,000 persons skilled in auto mechanics will graduate within a short time from Knights of Columbus night schools throughout the country. The Knights of Columbus course in auto mechanics, a 32 weeks course, makes a study of motor mechanism compulsory before driving is taught.

ODD ITEMS

As a result of price reductions in the automobile field cars in the price class under \$1000 on an average, now are selling for \$643. The high mark for this type of car was \$865 in 1920. The average in 1914 was \$637.

Because strawberries are bringing \$10 a crate along the eastern shore of Maryland and the Virginia section, negro planters are now buying passenger automobiles of the \$2000 to \$5000 class.

Throughout the United States there are 178,000 automotive dealers, charging stations, garages and repair shops.

THE AUTOMATIC ELECTRIC

THE Automatic Electric may be parked in a space four by eight feet. It is economical and efficient, with a speed of 15 to 18 miles per hour. Aside from its economy of operation the Automatic Electric has many distinct advantages. Because of its size it is ideal for use in congested traffic.

SCARCITY or inconvenience of parking space presents no difficulties. It is comfortably upholstered in leather, having a deep, soft seat and back rest. The placement of the steering and control levers is such that the driver may enjoy restful support at all times.

It is stated to be distinctive in appearance, noiseless, clean, every-ready and offers quick, convenient transportation.

The Automatic Electric is also manufactured in commercial and industrial shop car models, all having the same general chassis and mechanical features. The commercial model is unique and

ideally suited for the high-class merchant and retailer. It possesses distinct advertising value, because of its size and

This car has a cruising radius of 50 miles on one charge of electricity at a speed of 15 miles per hour, and a load



impressive appearance. It not only meets his haulage requirements, but insures clean, reliable deliveries at a small operating and maintenance cost.

capacity of 500 pounds. There is but one easy step from the seat to the curb and young women may act as chauffeurs as the car is very easy to drive.

Calendar of Conventions and Exhibitions

Feb. 6-11—Minneapolis, Minn., Seventh Annual National Tractor Show and Educational Exposition, National Implement & Vehicle Association, Minneapolis State Fair Grounds.

Feb. 7-10—Oklahoma City, Okla., Convention and Exhibition, Oklahoma Implement & Hardware Association; Secretary, W. B. Porch, Oklahoma City.

Feb. 7-10—Grand Rapids, Mich., Convention and Exhibition, Michigan Retail Hardware Association; Karl S. Judson, Exhibits Manager, 248 Morris Avenue, Grand Rapids; A. J. Scott, Secretary, Marine City, Mich.

Feb. 8—Minneapolis, Minn., Tractor Meeting, Society of Automotive Engineers.

Feb. 8-10—Minot, N. D., Convention, North Dakota Retail Hardware Association; Secretary, C. N. Barnes, Grand Forks, N. D.

Feb. 8-10—Milwaukee, Wis., Convention and Exhibition, Wisconsin Retail Hardware Association; P. J. Jacobs, Secretary, Stevens Point, Wis.

Feb. 8-11—Flint, Mich., Automobile Show, Flint Automobile Dealers' Association.

Feb. 9-16—Kansas City, Mo., Kansas City Motor Car Dealers' Association.

Feb. 11-18—Kansas City, Mo., Automobile Show, Kansas City Motor Car Dealers' Association, Overland Building; Manager, E. E. Peake.

Feb. 11-18—Atlanta, Ga., Second Annual Great Southern Automobile Show, Passenger Cars, Trucks and Accessories, Atlanta Automobile Association, Auditorium Armory; Show Manager, Virgil W. Shepard, 305 Connolly Building.

Feb. 11-18—San Francisco, Cal., Sixth Pacific Automobile Show, Motor Car Dealers' Association of San Francisco, Exposition Auditorium; Passenger Cars, Trucks, Tractors and Accessories; G. A. Wahlgreen, Manager, 215 Humboldt Bank Building.

Feb. 12—Madison, Wis., Ninth Annual Show, Automobile Dealer Division, Association of Commerce; Passenger Cars, Trucks and Accessories; Don W. Mowry, Manager, Cartwell Building.

Feb. 14-16—Chicago, Ill., Convention, Illinois Retail Hardware Association, Hotel Sherman; Leon D. Nish, Secretary, Elgin, Ill.

Feb. 14-17—Philadelphia, Pa., 21st Annual Exhibit and Convention, Pennsylvania & Atlantic Seaboard Hardware Association, Inc., Commercial Museum; Automobile Accessories, Etc.; Sharon E. Jones, Secretary, 1314 Fulton Building, Pittsburgh.

Feb. 14-17—St. Paul, Minn., Convention, Minnesota Retail Hardware Association; H. O. Roberts, Secretary, 1030 Metropolitan Life Building, Minneapolis.

Feb. 14-18—Kalamazoo, Mich., Automobile Show, Kalamazoo Automobile Dealers' Association.

Feb. 17-28—Trenton, N. J., Automobile Show, Trenton Automobile Trade Association, Second Infantry Armory; Manager, Frederick Petry, Jr.

Feb. 18-25—Hartford, Conn., Automobile Show, Hartford Automobile Dealers' Association, State Armory; Manager, Arthur Fifoot.

Feb. 18-25—Albany, N. Y., Automobile Show, Automobile Dealers' Association, State Armory.

Feb. 20-25—Bethlehem, Pa., Automobile and Accessory Show, Bethlehem Trade Association; Manager, J. L. Elliott.

Feb. 20-25—Grand Rapids, Mich., Automobile Show, Passenger Car Dealers' Association, Furniture Exhibition Building; Manager, M. D. Elgin.

March 11-18—Bronx, N. Y., Bronx County Automobile Show, Passenger Cars, Trucks and Accessories, 105th Field Artillery Armory, 166th Street and Franklin Avenue; Manager, H. G. Stiles, 2483 Tiebout Avenue, Bronx.

March 11-18—Newark, N. J., Automobile Show, Newark Automobile Dealers' Association.

March 11-18—Boston Show, Mechanics' Building.

March 13-18—Boston, Mass., Automobile Salon, Boston Automobile Dealers' Association, Inc., Copley Plaza Hotel; Manager, Chester I. Campbell.

March 13-18—Omaha, Neb., Automobile Show, Omaha Automobile Trade Association, Auditorium; Manager, A. B. Waugh.

March 15-18—Port Huron, Mich., Automobile Show, Port Huron Automobile Dealers' Association.

March 21-22—Ypsilanti, Mich., Automobile Show, Ypsilanti Automobile Dealers' Association.

March 23—Philadelphia, Pa., Sectional Meeting, Society of Automotive Engineers.

March 24—Detroit, Mich., Meeting, Society of Automotive Engineers.

March 24-25—Ann Arbor, Mich., Automobile Show, Ann Arbor Automobile Dealers' Association.

March 27-April 1—Oklahoma City, Okla., Sixth Annual Automobile Show, Coliseum, Oklahoma City Motor Car Dealers' Association; Manager, Edgar T. Bell.

March 28-31—Benton Harbor, Mich., Automobile Show, Benton Harbor Automobile Dealers' Association.

March 31—Chicago, Ill., Mid-West Meeting, Society of Automotive Engineers, "Various Commercial Fuels and Their Relative Characteristics."

April—Buffalo, N. Y., Second Annual Motors and Sportsmen's Show, Automobile Club of Buffalo; Manager, D. H. Lewis.

April 2-8—Battle Creek, Mich., Automobile Show, Battle Creek Automobile Dealers' Association.

April 27—Philadelphia, Pa., Sectional Meeting Society of Automotive Engineers.

April 28—Detroit, Mich., Meeting, Society of Automotive Engineers.

May—Trenton, N. J., Annual Convention, New Jersey Automotive Trade Association; Secretary-Treasurer, H. S. Moore, Trenton.

May 1-15—Scheveningen, Netherlands, Second Annual Automobile Exhibit; Secretary, No. 185 Spul, The Hague.

May 16-19—Chattanooga, Tenn., Convention and Exhibition, Southeastern Hardware and Implement Association (Alabama, Florida, Georgia, Tennessee); Secretary, Walter Harlan, Jacksonville, Fla.

June 11-15—Milwaukee, Wis., International Convention of Associated Advertising Clubs of the World.

June 19-25—Colorado Springs, Col., Summer Meeting, Automotive Equipment Association.

September—Rio de Janeiro, Brazil, Automotive Exhibition in Connection with Brazilian Centenary.

Sept. 18-23—Rome, Italy, Second Annual Meeting, International Chamber of Commerce.

Nov. 13-18—Chicago, Ill., Annual Convention and Business Exhibit, Automotive Equipment Association, Coliseum.

NATIONAL forests in the Centennial state had 1,200,000 visitors in 1921, an increase of 10,000 over 1920, according to the United States forest service. Many travellers were attracted to the land of living glaciers, in Colorado national forest, where 435,000 people were registered; others went to San Isabel and Pike reservations to fish, hunt or climb.

MANY who pitched tents in Overland park liked the climate so well that they decided not to hurry away; instead, they put up at a hotel or moved into an apartment. The secretary of state's office issued complimentary licenses, good for 90 days, to many, whose average stay was from three to six weeks.

Rocky Mountain National park was first among all parks during 1921, with an attendance of 273,737, an increase of 32,771 over 1920, and 100,573 more than the combined registration in Yellowstone and Yosemite national parks, according

LONE HORSE-DRIVER USES ELECTRIC HORN

TO COMMAND from pedestrians the respect they show operators of automobiles, a driver of a horse-drawn wagon in New York city has installed an electric horn such as is used on motor vehicles. The dry cells are beneath the driver's seat and the push button is conveniently located. It is not recommended that electric horn manufacturers spend too much money in developing this market, however, as the sales possibilities are too limited—the horse will soon be as rare as the far-famed Dodo.

to government figures, which are carefully compiled from authentic data.

SQUEAKING SPRINGS.

ASURE cure for squeaking springs and one that has been tried many times and not found wanting is composed of two-thirds paraffin and one-third graphite.

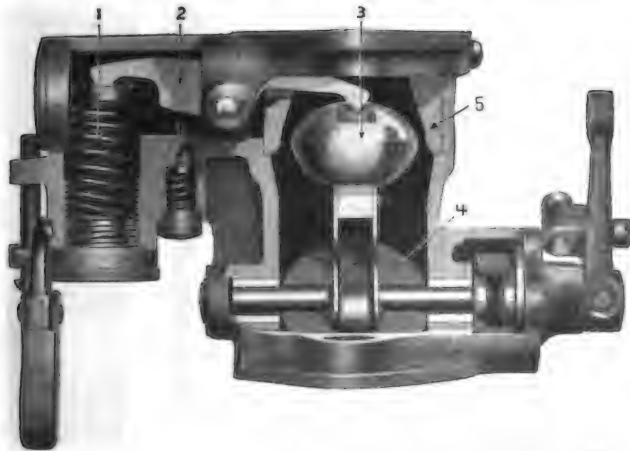
These two ingredients are first melted separately and then mixed while hot and immediately applied to the spring leaves with a brush. The car should be raised with either jacks or block and falls so as to allow the springs to open as far as possible. Work the mixture well between the leaves and after all are finished, lower the car on to the wheels. The mixture will quickly cool, and if necessary, residue can be wiped off.

OILING CAR DOORS.

Don't use ordinary cylinder oil as a lubricant for door hinges and latches. It has a tendency to run, which is not desirable at this location, because the clothes of passengers are likely to come in contact with it. Linseed oil mixed with a small amount of graphite is much better for this purpose. This furnishes a good lubricant and will not run.

ACCESSORIES DEPARTMENT

The Monarch Governor Model G is a special truck equipment which is stated to operate from the potential force of the moving gas in the intake manifold, a



method which can be used to better advantage to operate automatic mechanism to produce throttling effects. Only two moving parts form the basis of the action of the Monarch governor. An adjustable compression spring (1) provides spring tension which acts through the rocker arm (2) to the conoid (3) and cone (5) connected to the butterfly throttle valve (4).

The spring is of the conventional compression type and makes possible a wide range of governed engine speeds. Suitable adjustment is secured by removing the cap at the bottom of the spring housing and turning the slotted screw provided for this purpose.

The conoid or governing member (3) in conjunction with cone (5) controls the governor action. Held normally in a wide-open position by the spring, the conoid is acted upon by the velocity of the explosive charge passing from the carburetor to the intake manifold. The increase in velocity overcomes the resistance of the spring and causes the conoid to rise in the tapered cone, closing the butterfly valve to which it is connected, thus controlling the speed of the engine.

Phosphor bronze bearings are used at all bearing points, which assure long life to the governor.

Manufactured by the Monarch Governor Co., Detroit, Mich.

Chromine is a new anti-freezing compound for automobile radiators that has received the approval of scientists who have tested it. It is a patented compound of chemicals which prevents freezing at any pre-determined temperature. The compound does not evaporate and tests show that it has no effect whatever on the metal and rubber in an automobile cooling system. Chromine eliminates even the rust which results when plain water is used.

Chromine was developed by Dr. Miller

Reese Hutchinson, formerly chief engineer of the Thomas A. Edison interests, inventor of the well-known Klaxon horn, and one of the best known engineers in the United States. After months of experimentation with particular attention to testing its anti-freezing, anti-corrosive and immunity from electrolytic action, it was decided to place chromine on the market.

It is claimed that a single charge of Chromine in the cooling system will last an entire season. The directions for its use are as follows: Drain off all water from the radiator. Then thoroughly dissolve the proper amount of Chromine in a pail of water (preferably warm) and pour the solution into the radiator. Add enough water to fill the radiator, then run the motor a few minutes in order that the distribution of the Chromine solution will be complete. Keep



the radiator full—add water frequently. It is not necessary to add more Chromine as it does not evaporate.

Manufactured by the Pyrene Manufacturing Co., 17 East 49th Street, New York City.

Columbia Irreversible Steering Gear for Fords, embraces the desirable features of irreversibility and safety at a very low price. It eliminates the tiresome arm strain characteristic of reversible gears and because of its irreversibility becomes a factor of safety in the handling of the car. The Columbia steering gear has three moving parts and operates on the same irreversible principle employed on the higher priced cars. All the bearings are of large surface and ample facilities for lubrication are provided. No machine work is necessary for the installation of

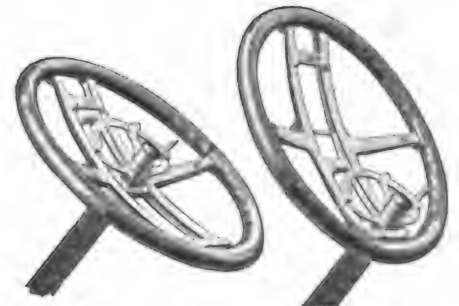
the gear. It is slipped on over the lower end of the steering post and bolted to the same holes in the frame. The small gears at the top of the steering post are not



disturbed. Thirty minutes' work will install the gear.

Manufactured by the Columbia Carburetor Co., 111 West Monroe Street, Chicago, Ill. Sold through jobbers and dealers.

The Neville More-Room Steering Wheel installed in closed or open cars gives the driver additional room for entering or leaving the car and provides convenience and comfort that has come to be recog-



nized by many manufacturers and dealers who, it is stated, have ordered this wheel in quantities and installed it on their cars as regular equipment.

The Neville wheel is simple in design and construction, strong, light in weight, and combines beauty in design with strength, durability and mechanical perfection; the manufacturer states it is easily installed.

Manufactured by the Neville Steering Wheel & Manufacturing Co., Wayne, Ind.

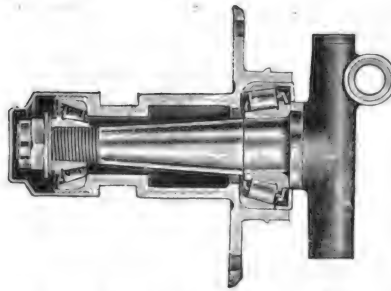
(When Writing to Advertisers, Please Mention the Automobile Journal.)

Gemco Baf-Oil Plugs form combustion chambers into which the spark plugs are screwed in the usual manner. In each chamber are two baffle plates, which prevent the oil from reaching the firing points. Each plug is a unit in itself and has no mechanical contrivance to wear out or cause trouble. Oil is prevented from reaching the firing points and is not burnt into harmful carbon.

A priming feature is included in the $\frac{1}{2}$ -inch size, which adds materially to its usefulness in cold weather.

The baffle plates prevent the oil from reaching the firing points and become extremely hot when the motor is in operation and act as hot spots which completely vaporize the gas, states the manufacturer. When the spark occurs the

load and thrust with the result that there can be no binding either when travelling straight ahead on a level road, negotiating turns at high speed or by end thrust, often resulting from the nature of the road.



$\frac{1}{2}$ Inch
Standard



PRIMING FEATURE



$\frac{7}{8}$ -18
S.A.E.

highly vaporized gas in the combustion chamber ignites and shoots into the cylinder proper, causing a clean explosion that increases the power of the motor and reduces carbon deposit.

The manufacturer states that there are more than 10,000,000 oil pumping cylinders that would be greatly benefited by the installation of the Baf-Oil plug.

Manufactured by the Gemco Manufacturing Co., Milwaukee, Wis. Price, $\frac{1}{2}$ inch standard, \$1; $\frac{7}{8}$ inch, \$1.25.

The F. and H. Taper Roller Bearings for Ford and Chevrolet front wheels are self-aligning, adjustable and permanent, the manufacturer states.

The efficiency of a taper roller bearing is largely due to the correctness of the taper and the angle of the several parts to properly distribute the load.

In the F. & H. roller bearing this problem has been worked out with mathematical accuracy. It is stated: Taper and center line of the rollers being designed to perfectly meet the requirements of

The cone and rollers are forged from high carbon chrome alloy steel bars slightly oversize, then heat treated and hardened in oil, giving a uniform hardness throughout. The roller separator is a high, carbon steel stamping of such design that the rollers are always held in correct positions and the bearings become self-aligning and are easily adjusted. The separator is complete in one piece, heavy enough to retain its form and holds the rollers in position on the cone even when the outer bearing cone is removed.

The drop forgings of high, carbon chrome alloy steel for the cone and outer ring are, after being thoroughly hardened, finished on micrometer grinders to mechanically perfect size and contour, thus giving a high finish of these vital parts which insures the maximum efficiency, it is stated, and the minimum of friction.

The rollers are interchangeable with the ball bearings supplied in Ford and Chevrolet front hubs without machining or modification of either bearings, hubs or axles.

Manufactured by Fulton-Houston Co., 1146-50 S. Michigan Avenue, Chicago, Ill. Price, set of four for two wheels, \$10.

The Gridley Piston and Piston Ring Machine may be used with either belt or electric motor drive, the latter being recommended by the manufacturer as the speed may be varied to suit conditions of work. Namco self-opening dies are also recommended where speed is essential, the manufacturer stating that as threading is best accomplished by using the self-opening die, because of its strength, simplicity and positive opening action. The fixtures employed for opening die threading and tapping are simple in construction and springs are not used for returning the tool to its reoperative position.

Namco collapsing taps range in size from $\frac{7}{8}$ inch to $7\frac{1}{2}$ inches and cover prac-



tically all needs of inside rethreading in the automotive industry, it is stated. Automatic taps are also made in the style known as the outside trip, which insures collapsing action at the required depth regardless of any irregularity in the chucking up of the work. The chief difference between the outside trip and the inside trip consists not in the principles of collapsing action of the trip proper, but rather in the exterior design, which is

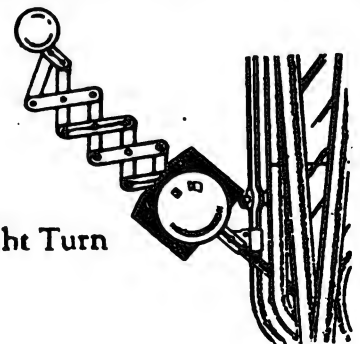
governed by the classes of work done and the kind of machine to which the tap is applied.

The Gridley single spindle automatic lathe is completely equipped with the necessary tool holders, slides, forming tool holders, cutting off tool holder corner stop, complete outfit of cams for medium and coarse feeds, etc.

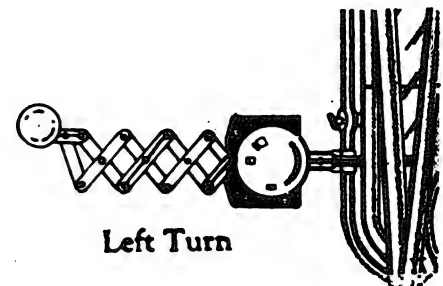
The Namco self-opening die head is an extra which is furnished on order, making the lathe and its attachments fully automatic.

Manufactured by the National Acme Co., Cleveland, O. Prices and literature on request.

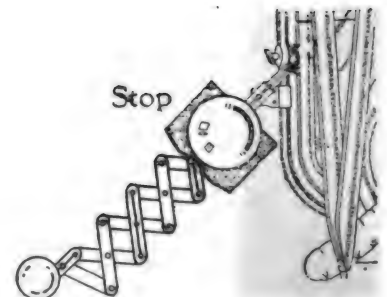
The Wolter Auto Signal is designed to protect the car and its occupants from accidents and collisions at all times and more especially, when the car is curtained or enclosed. This signal gives the driver of an approaching or following car detailed information of your intentions. If one intends to turn to the right the signal points upward; to the left, the signal



Right Turn



Left Turn



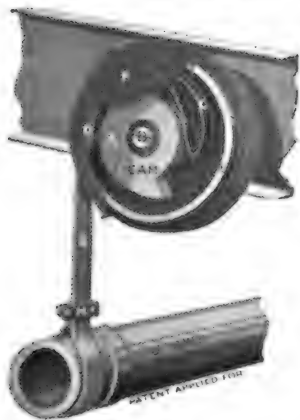
Stop

points to the left and if one intends to stop, the signal points downward. At night the signal is illuminated by a small electric bulb enclosed in the arm. A ratchet located six inches from the steering wheel operates the signal which is easily installed in a few minutes time by anyone handy with tools.

Manufactured by the Wolter Auto Signal Co., 2800 Rucker Avenue, Everett, Wash.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

Velvet Recoil Deadeners are designed to check the recoil of the car body with relation to the chassis when passing over rough or uneven ground. Its great rapidity of action keeps the strap on the Deadener taut, thereby absorbing all of the bumps, and preventing jerks when the car passes over several bumps in succession. In operation, as the body of the car goes downward, the spring on the opposite side of the drum winds up on the drum and instantly takes up the slack in the strap. This action also slides spring (C) downward on the stationary cam to a point where it has the least pressure. As the



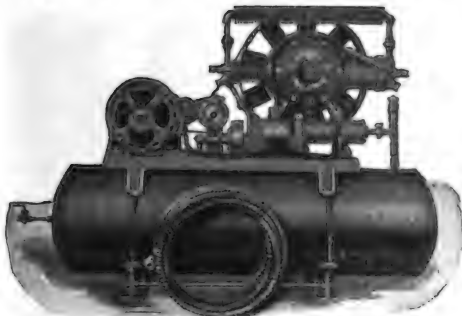
car goes upward on the rebound, the drum revolves, sliding spring (C) upward on the cam, the cam acting as a brake, until, when the spring reaches point (A) on the cam, the pressure is so strong that it stops the up-throw of the car, but has done so gradually. The up-throw has also been held back by the spring on the opposite side of the drum, and this springs the Deadener back instantly into position as the car body comes down, rewinding the strap so as to prevent slack.

The action of the Deadener is to smooth out the recoil and soften the spring action of the car, thereby causing smooth riding without disagreeable effects.

Manufactured by the Blackledge Manufacturing Co., 341 East Ohio Street, Chicago. Prices and literature on request.

The Gardener Two-Stage Air Compressor is designed primarily for garage and service station service where it is desired to give high grade inflation service and have a supply of pressure air available for other work. Three superior features are claimed for the Gardener compressor, which are, namely, the scientific method of oiling, efficient compression, and a good organization with which to deal.

The Gardener method of lubrication, it is stated, guarantees clean air free from oil, and distributes the oil drop by drop,



as required by the bearings and pistons, without oversupplying these units. Compression is obtained direct without waste and without clearance, it is claimed, 1-64 inch leeway being allowed at the end of the stroke, which is considered sufficient. This construction overcomes clearance at the intake and exhaust valves as well as at the end of the piston stroke, allowing the compressor to push out a full cylinder of compressed air with each stroke.

The company manufacturing the com-

pressor has 60 years of successful business behind it, and states that if 10 years from now a purchaser wishes to replace parts, the company will give satisfactory service.

Manufactured by the Gardener Governor Co., Quincy, Ill. Prices and literature on request.

New Model Simplex Theft-proof auto lock, designed for factory installation and made of case hardened steel (an improvement that it is claimed makes the lock impregnable), is being placed in production. In this lock the steering post locking feature has been combined with an ignition lock and the utility of both embodied in one accessible unit in the bracket which supports the steering column at the instrument board.

The combined steering post and ignition lock offers double safety. It is claimed, in that a car so equipped cannot be steered, nor can the motor be operated. Furthermore, the device eliminates the possibility of the owner forgetting to lock the car, as the ignition switch lever also operates the steering post locking mechanism. This same unit may also include the lighting switch.

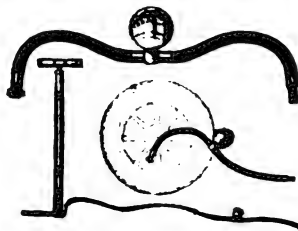


Automobile manufacturers are said to be interested in the fact that the use of the new Simplex theft-proof lock does away with the cost and the necessity of assembling ignition and lighting switches and makes it possible to offer adequate theft protection to car owners at little extra cost.

Manufactured by the Simplex Corporation, Chicago, Ill. Prices and literature on request.

The Apex Tire Gauge and Extension Hose, designed to be used with either hand or power driven pumps, shows at a glance the amount of tire inflation. The tire gauge and extension adds 14 inches to the regular tire inflation hose and is easily attached or detached by means of special connectors from the regular hose.

Among the many other devices manufactured by this company are included pump connections, quick acting foot pump connectors and assemblies, gasoline



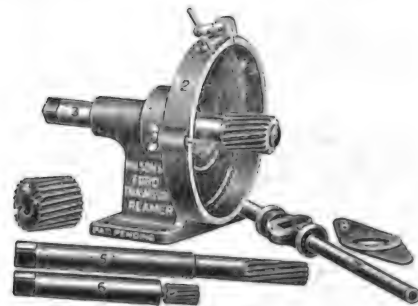
gauges which fit the opening of the regular gasoline tank, auxiliary carburetor throttles for Fords, running board pumps, hand pumps and disc wheel extension hose used for inflating tires on disc and wire wheels.

Manufactured by the Apex Electric Manufacturing Co., 1410 West 59th Street, Chicago, Ill. Prices and literature on request.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

The Wilson Transmission Bushing Reaming machine is designed especially for reaming Ford transmission drums after they have been bushed to make them run free and true on the shaft. Statement is made that transmission drums reamed with this machine will revolve absolutely true without wobble or noise, the machine performing a perfect job in less than 30 minutes.

It is claimed that more than 4300 of these machines have been sold throughout the country and as far as known are in every day use. The device consists of a

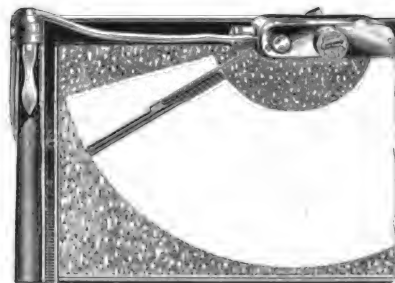


bench tool which fastens to the work bench. A large clamp band holds the transmission drum securely, while the reamer is being turned by hand. Reamers are supplied to fit the different sizes of bushing required in the transmission drums.

Manufactured by K. R. Wilson, 10-16 Lock Street, Buffalo, N. Y. Price complete, \$75.

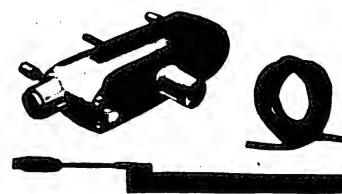
The Eveready Automatic Windshield Cleaner is a vacuum type cleaner, which is attached to the top bar of the windshield, cleaning the outer surface of the shield in front of the driver's vision from the time that the vacuum motor is turned on until it is shut off by the driver.

Statement is made that the rubber wiper will work satisfactorily in the hardest storms, providing a clear view of the road



for the driver regardless of weather conditions.

Installation is very easy, as all that is required is fitting the cleaner on the windshield and connecting the rubber tubing to the intake manifold of the engine, the vacuum motor doing the work as described. The control button for operating the motor is within easy reach of the

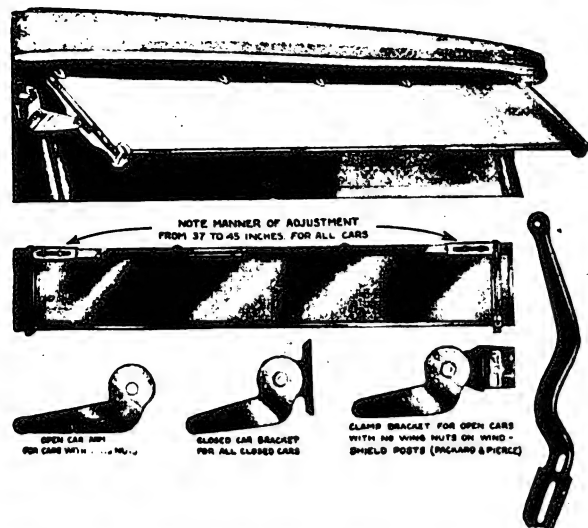


driver. This device is finished in nickel to harmonize with the highly finished parts of the car and is so constructed as to give many years of service.

Manufactured by the Apex Electric Manufacturing Co., 1410 W. 59th Street, Chicago, Ill. Price, \$10.

The Brinck Storm and Sun Shield is designed to meet the demands of the dealer or jobber who wishes to stock the least number of sizes to fit all cars, as it is easily fitted to the windshields of all cars by means of simple adjustments which can be made in a few minutes time.

The Brinck storm and sun shield offers to drivers a perfect protection from sun, rain and snow and is claimed to be the final addition necessary in obtaining the maximum comfort and safety from the automobile. House transparent colored



glass forms the shield which is supported along the top and at the lower end by special brackets which prevent the glass from rattling.

The two side brackets are of cast aluminum, highly polished and are joined by a bar of mild steel, which makes a very rigid yet adjustable frame. The glass is of triple strength and may be had in blue, green, or amber. It is held firmly in a bed of felt by five aluminum clamps. Each color is of the same efficiency, preventing all glare and allowing perfect vision when driving.

Manufactured by the Brinck Manufacturing Co., Moline, Ill. Price, \$18.

Milwaukee Visible and Rapid Delivery Curb gasoline pumps are designed to serve customers quickly and to show at a glance the amount of gasoline being filled into the customer's tank either by means of a visible filling bottle graduated in gallons or by means of an indicator facing the customer.

Two types of the visible pump are offered. Type 58B is equipped with the power pump located in the base, while type 58A is arranged so that the power pump may be located in an adjoining building. Type 361 Rapid delivery five-gallon continuous motion speed pump is claimed to be able to handle 18 gallons a minute with slight effort. Slightly over 12 turns of the crank deliver five gallons while the plunger is returned by two revolutions. Adjustable measuring stops mounted on ball bearing guide, enable the operator to draw accurately one, two, three, four or five gallons at a single stroke.

Considering the unusual speed, very little effort is necessary to run the operating crank. All operating parts are completely enclosed, protected from dust and weather at all times. To operate, it is only necessary to unlock machine and insert handle. The parts are easily accessible through opening two lockable doors which expose the mechanism.

In the visible type a specially designed rotary gasoline pump is installed in the base of the dispenser, which is operated by an electric motor encased in a steel jacket, making it impervious to gasoline vapors. For those who prefer this type

of pump the visible type offers a unit which has passed through the experimental stage and has been pronounced



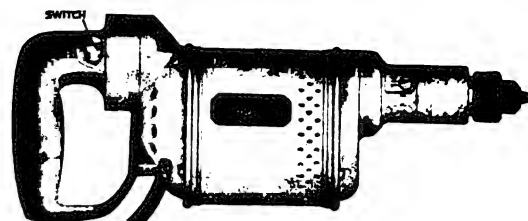
thoroughly practical, and carries the seal of approval of the Underwriters' Laboratories.



Manufactured by the Milwaukee Tank Works, Inc., Milwaukee, Wis. Prices and literature on request.

The Cincinnati Electric Drill is a light weight portable tool designed for garage and service station uses and has a capacity of 3/16 inch. This is the latest addition to the Cincinnati line of electric drills and grinders and is manufactured to meet the need for a light and frictionless, high-speed, powerful tool that is

adapted to all kinds of drilling. It is suitable for drilling in steel, brass, aluminum and sheet metal and for automobile body work, car building, window frames and wood boring.



While thoroughly simple in construction, the new drill is compactly and substantially built. It is equipped with Universal Motor, for use on direct and alternating current of the same voltage. The motor housing, end caps and handle are made of special strength aluminum, insuring minimum weight. The armature and gear studs are mounted on ball bearings which practically eliminate all friction. Gears are of special analysis high grade steel. The switch is the "Cincinnati" special quick make-and-break type with 50 per cent. overload allowance. It is entirely enclosed in the handle and is operated by a trigger conveniently located in the handle.

In addition to the new drill the company makes a complete line of portable electric hand and heavy duty drills, bench, floor, aerial and tool post grinders and buffers.

Manufactured by the Cincinnati Electrical Tool Co., Cincinnati, O. Prices and literature on request.

The HB Independent Lighting and Power Plants are so designed that they adequately fill the needs of isolated service stations and garages for power to supply necessary lights and current for battery charging purposes. Many of these outfits have been sold and the testimonials received are said to be very gratifying, many of the users reporting marked economy of operation and longevity of the machine.

HB generators are designed to be belt driven from the shop line shaft or by a gasoline engine and include a control panel on which is mounted the control



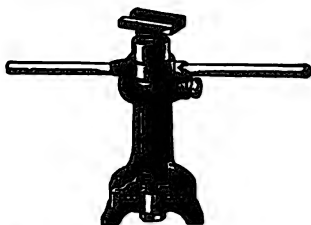
switches and instruments. Ball bearings are fitted to the armature shaft, which require lubrication at four-month intervals, reduce friction to a minimum and provide long life to the machine. The generators are built in several sizes with capacities for every need. A partial payment plan is offered the purchaser which makes possible the machine paying for itself while performing work.

Manufactured by the Hobart Bros. Co., Troy, N. Y. Prices and literature on request.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

The Millers Falls 15 Ton Jack No. 155 is designed especially for heavy duty truck and tractor service and features several special ideas. The No. 155 jack is of the horizontal type which is easily placed in close quarters and is operated by a short horizontal handle which extends at either side. Roller bearings are used in the base between hardened steel discs which carry the load of the jack in lifting which makes possible the raising of the tonnage stated.

The ratchet operates to either the right or left by simply turning the knurled ratchet pawl. The concave steel cap is set fast to the upper end of the screw, and both remain stationary while the barrel revolves around the screw.



The king belt passes through the stationary base into the barrel and revolves with it. The screw has a perfectly cut acme thread which meshes correctly with the barrel. When the screw reaches its topmost point the stop pawl automatically prevents its being turned out of the barrel, doing away with any possibility of the load falling.

The concave shape of the cap adapts it to any shape of axle, while the round base gives a sure solid footing regardless of ground conditions.

Manufactured by the Millers Falls Co., Millers Falls, Mass. Price and literature on request.

The "Dot" High Pressure Lubricator for passenger cars and trucks consists of a grease gun, a filler for the gun, nipples to conduct the grease from the gun to the bearings and dust caps for the nipples.

It is essentially a one-hand operated gun, solidly built as one unit and eliminates the annoying flexible tube so commonly used. One of its principal features is a patented automatic valve which opens and closes when the gun is attached to and detached from the nipples. In using the gun its nozzle end is placed over the nipple and the gun is then turned one-quarter turn to the right. During the first half of this turn the gun is securely clamped to the nipple and the connection



is sealed against any amount of grease pressure that may be required for lubricating the bearing. During the second half of the one-quarter turn to the right the valve in the nozzle is opened, permitting the grease in the gun to be forced through the nipple onto the bearing. The valve cannot open, however, until the connection has been thoroughly sealed. Leakage during lubrication is impossible, it is claimed, because as the pressure of grease is increased the connection becomes more firmly sealed. After the bearing has been lubricated the gun is detached by giving it a quarter turn to the left. During the



first part of this quarter turn the valve is closed, and then during the second half of the quarter turn the nozzle is unlocked and the gun may then be slipped off of the nipple. The automatic valve contributes many of the working advantages of the "Dot" gun. The nipples are made in all

the forms and with all the different threads necessary to adapt it to any chassis. They screw on in the same place that grease cups are used and are designed to receive the grease from the gun and conduct it to the bearings. These nipples have a very ingenious and very attractive looking dust cap which is an adaptation of the Carr "Durable Dot" fastener. The important advantages of the "Dot" gun itself are well supplemented by the unique patented filler which goes with it as regular equipment. This filler will take the grease from any grease container irrespective of its size and shape and will fill the gun very quickly and cleanly, and without the user's hand touching the grease at all. By means of this filler it takes less than one-half minute to fill the gun solidly full of grease.

Manufactured by the Car Fastener Co., Boston 39, Mass. Price and literature on request.

A Kerosene-Air Engine Cleaner has recently been placed on the market which uses air from the service station tire inflation pressure system and with the aid of a small can of kerosene quickly washes off the accumulation of dust and oil adhering to the engine base and cylinders. A nozzle of suitable size is provided which is connected to the air stream and to the kerosene can by rubber tubes. The air passing out of the nozzle under pressure



draws the kerosene from the container and sprays it with sufficient force to wash off the greasy deposits in very quick time.

After the surface of the engine has been cleaned with the spray, the kerosene may be shut off entirely and the engine dried with the air jet. The cleaner, it is stated, will fit all makes of air chucks so that it may be used universally.

Manufactured by the Imperial Brass Manufacturing Co., Chicago, Ill. Price on request.

The Super-Weld Creeper No. 196 consists of a combination head rest and anchor device for the service station repairer who is obliged to work under a car or truck.

The creeper is constructed of steel with all joints electrically welded and finished in bright red so as to be easily seen by car drivers. A special head rest is provided



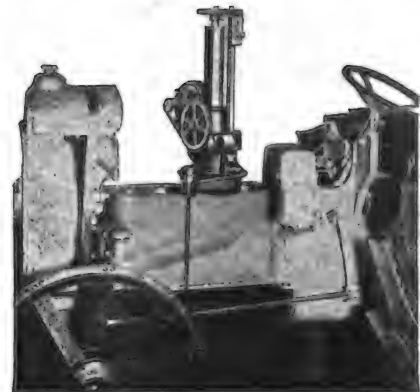
which when in the raised position locks the creeper, preventing forward or backward movement.

Roller wheels are provided for moving the creeper under the car and there are neither bolts or nuts to loosen.

Manufactured by the Welded Products Manufacturing Co., 145-149 Clinton Street, Milwaukee, Wis. Price, East of the Rockies, \$7.50.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

The New Storm Motor-Driven Cylinder Reboring Machine is shown herewith. It is designed especially to meet the requirements of average sized garages where electric current is available and possesses a number of unique and important features. The machine is built extra heavy and rigid throughout, using the Storm patented power machine cutter heads, these heads being supported by a heavy, rigid, hardened steel bar, which is ground to perfect accuracy and exact size. Extra long, heavy machine bearings give rigid support to the bar. These bearings are adjustable so as to take up any play



and can be easily kept in perfect adjustment. Cutter gears are used throughout and a heavy internal feed screw and feed bar. Its total capacity is 2 1/2 to six inches, sufficient to take care of practically all sizes in common use. The machine weighs approximately 300 pounds.

A heavy base, not shown in the cut, is provided for use in connection with the machine for shop work, making it a permanent and convenient shop fixture, and yet it has the big advantage of being capable of use independent of the base as shown for reboring motors of all types without removing them from the chassis.

The machine is furnished for boring only or for both boring and burnishing. The burnishing head consists of a hardened steel arbor having a special shank to fit the boring bar and is surrounded by special tool steel rollers all ground to exact micrometer size, and are held in a special roller housing. In using the burnishing heads the cylinders are first bored slightly under the desired finished size. After all the cylinders of the block have been bored to this size the cutter head is removed and the burnishing head is substituted. The rollers work in oil and pass through the cylinder compressing the metal by crowding it back, giving it an extra hardness and polished smoothness. The result is a true, accurate, smooth bore, greater efficiency in the operation of the motor and longer life of the cylinder walls.

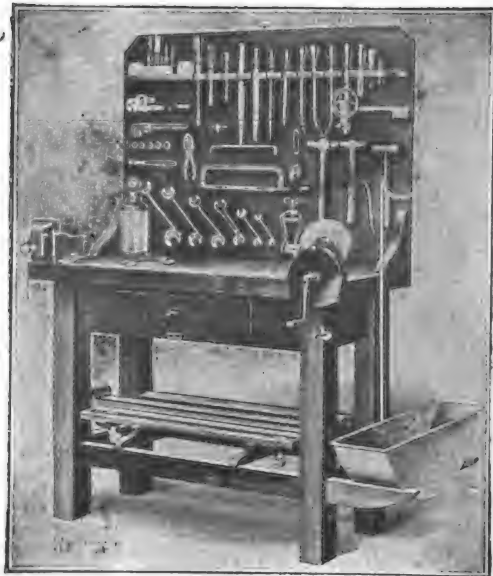
Manufactured by the Storm Manufacturing Co., 406 Sixth Avenue, South, Minneapolis, Minn. Price and full information on request.

The Millers Falls Three-Ton Truck Jack No. 150 is designed especially for use with trucks up to three tons capacity. It operates easily with one hand and can be operated under over-hanging bodies as it works with a horizontal lever action. By turning the knurled ratchet pawl the ratchet is operated to either the right or left as desired. When the screw reaches the maximum height the stop pawl automatically prevents it being turned out of the barrel, eliminating the possibility of the load falling. A forged screw is used fitted with a perfectly cut acme thread, which meshes correctly with the barrel. The cap is broad and concave in shape, adapting it to any shape of axle. The base is purposely made wider than necessary to prevent sinking in soft spots.

Manufactured by the Millers Falls Co., Millers Falls, Mass. Price and literature on request.

The **Motorquip** is designed primarily for the private owner of a motor truck, passenger car or tractor, but can be used to advantage by anyone who is called upon to use tools occasionally in the repair of farm power machines or other devices which are used commonly about the farm, plant or small service station.

The outfit consists of a neat hard wood bench and back board of maple, equipped with every tool and device that may be



needed by the owner in making repairs to his machine. The space which each tool occupies on the back board has the shape of the tool outlined so that the tool is easily replaced after use in its correct position on the board.

A test tank for testing tubes under repair is located at one end of the bench, while a creeper for working under the truck or car is placed underneath the work bench. A hand-power grinder occupies one corner and a vise the other, with a small tool drawer underneath.

The **Motoquip** occupies but little space in the garage or work shop and its use in connection with home repairs will cut down materially garage repair bills.

Manufactured by H. C. Dodge, Inc., Motoquip division, 32 Alger street, Boston, Mass. Prices and literature on request.

The **Block, Jr.**, is a powerful jack that is designed and built to operate easily, quickly and safely. It is constructed entirely of heat-treated steel and malleable. The design permits of easy replacement of



parts. The extension locks securely in all positions.

The **Block, Jr.**, jack serves practically every purpose in the average garage. Its specifications are as follows: Collapsed height, four inches; extended height, 20 inches; capacity, one ton; weight, 27 pounds.

Manufactured by the Zim Manufacturing Co., 208 North Wabash Avenue, Chicago, Ill. Price on application.

The **New American Visible Curb Pump** is of five gallons capacity, embodying the single-acting, quick-return features. The five-gallon visible container can be filled and drained in from 35 to 40 seconds. The pump itself does the measuring and discharges a mechanically accurate five gallons into the container with the graduations on the container acting only as a check. This makes it unnecessary for the operator to gauge the measure by the eye.

(When Writing

The glass cylinder, being thoroughly protected by heavy expanded metal, any chance of breakage or fire risk is removed.

The pump is arranged so as to pump five gallons into the container in 16 complete strokes, $13\frac{1}{2}$ on the up-stroke and but $2\frac{1}{2}$ on the down.



Manufactured by the American Oil Pump & Tank Co., Cincinnati, O. Prices on request.

The **Perfection Disc Wheel** is a resilient, laminated steel disc, demountable wheel, with several new and interesting features. It is made up of laminations of steel discs welded together, giving great strength and lightness. The shape and "cut-outs" in the outer diameter of the disc next to the rim, as shown in the illustration, allow for considerable resilience—unusual in this type of wheel, the load being suspended as in a wire wheel.



It is claimed that this resilience makes for easier riding and tire economy.

As an added feature the valve stem extends through the outside, facilitating the inflation of the tires. These wheels can be quickly mounted on the wood wheel hubs and are demountable for quick tire changes.

The **Perfection disc wheels** come in sets of five at considerably reduced prices. Ex-

clusive agencies are given to car dealers for their particular type of wheel, and territory is now being allotted for the coming year.

Manufactured by the **Perfection Motor Parts Co.**, 418 Lightner Building, Detroit, Mich. Prices range from \$42.50 to \$62.50 for sets of five.

Truck-Grip Chains, the newest chain device for motor trucks is stated to be attracting most favorable attention where-



ever it is shown. The chains are snapped directly on to a steel ring, known as a retaining ring, that is fastened to the spokes by the use of hook bolts. The chains can be snapped on and taken off the ring in less than a minute. The arrangement is such that entire flexibility is obtained, as to the number of cross links used. In case one wheel only encounters bad ground, as frequently happens in running off the side of the road, all or part of the links from the opposite wheel may be snapped on to secure additional traction. Broken links cause no delay and are quickly replaced.

Manufactured by the **Truck-Grip Chain Co., Inc.**, New York City. Price, etc., on request.

The **New Klaxon 12-A Horn**, recently announced by the Klaxon Co., has the same deep, powerful, unmistakable note which is produced by the highest priced Klaxon. The workmanship and materials in this new signal are of standard Klaxon quality. The signal bears the standard Klaxon guarantee and is backed by the nation-wide Klaxon service. The low price is made possible a simplified construction requiring less labor and material.

The new **Klaxon 12-A** is finished in a smart black baked enamel with an orange rim. A unique feature is its three-legged universal bracket. By means of this new bracket the **Klaxon 12-A** may be mounted



on the dash—under the hood—of practically all makes and models of motor vehicles.

Ever since the first electric motor driven horn, the **Klaxon 20-L**, was built by the Klaxon Co. in 1908, which is stated to be one of the finest automobile signals made and is standard equipment on the most expensive cars, owners of medium and small cars have wanted a horn having the same dependable warning power—at a lower price. This is now afforded in the new **Klaxon 12-A**.

Manufactured by the **Klaxon Co.**, Newark, N. J. List price, \$10.

The **Illuminated Bar Radiator Cap**, a patented device, offers many useful and exclusive features in addition to being an ornament, for both day and night driving. Designed along the lines of the ordinary bar cap, the ends of the bars contain small incandescent electric bulbs, furnished either in frosted, white, red or green colors according to the desire of the motorist. The wires leading to the bulbs are protected by a wall which prevents the moist steam from the radiator affecting the insulation.

Among the many advantages of a light of this type may be mentioned a parking light consuming a small amount of cur-



rent, running side lights, motor meter illumination for night driving, trouble light for engine repairs on the road and a suitable socket in which to connect trouble light.

Distributed by the **Automobile Engineering Co.**, 14 W. Washington Street, Chicago, Ill.

The **Diamond Stop and Turning Signal** consists of two small diamond shaped lamps fastened at the right and left sides at the rear of the machine, and in plain view of the driver following. These lamps are made in such manner that they are effective day or night. Both showing red indicates the driver's intention to stop; the left showing red means a turn to the left, while the right lamp showing red indicates a turn to the right.

The equipment includes a pilot light on the signal switch, which remains lighted as long as either of the three signals are given, thus indicating to the driver that the signal is operating properly. The signal switch clamps to the steering wheel



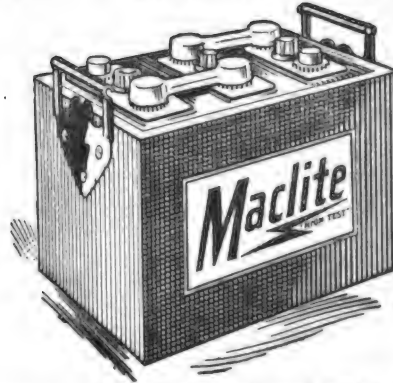
post in a position easily accessible for the driver. Additional lamps may be installed at the front of the car which will indicate to approaching drivers the car operator's intention, these additional lamps being likewise operated from the small switch located on the steering post.

The signal lamps, switch and wiring are made of the best material obtainable and add materially to the appearance of the car, protecting the car and its operator against rear end or front end collisions when turning corners or travelling in congested streets.

Manufactured by the **Diamond Signal Co.**, 181 Beale Street, San Francisco, Cal. Prices and literature on request.

Mac-Lite High Test Storage Batteries are designed to give the user extra long life and exceptional power. The exacting care used in the selection of the best materials obtainable, and the special method used in manufacture, it is claimed, make this battery a superior article.

The separators are electrically treated to remove foreign organic matter, a method which the manufacturer considers far



superior to chemical treatment which removes this matter only from the surface, and does not penetrate the wood.

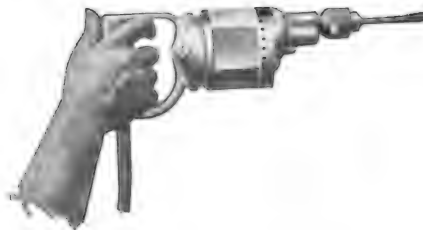
A two year guarantee accompanies each battery, which is given in writing, and is good for two years from date of sale.

Five features are mentioned by the makers as being incorporated in this battery which makes this guarantee possible. They are: Tough plates, insuring long life; greater capacity for the same plate area and a higher momentary discharge rate than certain soft plate batteries; an unusual recharge efficiency and an absolutely non-sulphating feature.

Manufactured by the **Mac-Lite Storage Battery Co.**, 62-64 Stanhope Street, Boston, Massachusetts. Prices and literature on request.

The **New Black & Decker Light Weight Quarter-Inch Portable Electric Drill** is designed for drilling in metal or wood. This drill has an aluminum alloy housing and weighs only five pounds. It has double reduction gearing, giving a no-load speed of 1600 revolutions per minute. This drill is similar in all respects to the rest of the Black & Decker line, having stub tooth gears cut from chrome-nickel, heat-treated and running in grease in a grease-tight gear box like an automobile transmission.

All the bearings are removable and renewable and this drill is equipped with a special pistol grip and trigger switch, with the switch mechanism arranged in the grip, which makes it particularly adaptable for close corner work. As the illustration shows, the drill spindle is arranged in such a manner as to make it possible to drill within about an inch of any obstruction. This drill is particularly accessible. The brushes can be renewed from the outside of the case. By removing four screws the motor commutator, switch mechanism, field leads and cord terminals may be entirely exposed. The commutator end bearing of the motor armature is carried in a spider, which is integral with the motor case, making it impossible for the armature to get out of alignment and making it possible to inspect the commutator and clean it while the drill is running, as the removal of



the cover plate does not interfere in any way with the operation of the tool.

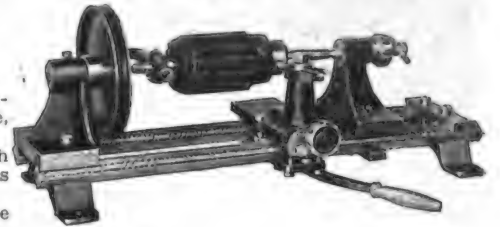
A special light weight rubber covered cable is supplied and a clamp is provided in the pistol grip, so that strains on the cable have no tendency to pull the terminals loose from the switch. The cable conductors are attached to the switch

block by means of screw terminals, making it very simple to renew the cable when necessary, without the need of soldering any joint.

This tool is covered by the same guarantee which manufacturer gives on the larger sizes and has been built particularly with a view of giving long service and efficient performance.

Manufactured by the **Black & Decker Manufacturing Co.**, Towson Heights, Baltimore, Md. Price, complete with three-jaw chuck, flexible cord and attachment plug, \$39 net list, East of Denver, Col.; \$39.50 for Denver and points West.

The **Onan Lathe and Mica Undercutter** is a combination unit making it possible



to true up and turn the commutator of any starter or generator armature in the same manner as with the large engine lathe—then without removing the armature from the lathe it is possible to undercut the mica between the bars in a workmanlike manner in less time than by any other method.

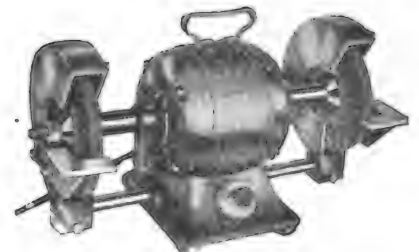
The turning tool is controlled by hand wheel, screw feed—the carriage is operated lengthwise by a drop-forged handle with suitable adjustment for every commutator. The undercut is straight and uniform. The lathe is built with a seven-inch swing, bed 22 inches long, furnished with two Armstrong high-speed tool bits, lathe dog, suitable wrenches, etc., and is complete ready for operating.

It is driven from any available power or from the Onan testing device.

Each lathe comes packed in a strong shipping case. The shipping weight, complete, is 35 pounds.

Manufactured by **David W. Onan**, 43 Royalston Avenue, Minneapolis, Minn. List Price, \$35.

The **Black & Decker Six-Inch Electric Bench Grinder** can be supplied for 40 or 60-cycle alternating current or for direct current for 110 or 220 volts. In ordering for alternating current the frequency should be specified. This new six-inch electric grinder is a substantial two-wheel bench equipment with a quarter-horsepower motor. The grinding wheels are six inches in diameter by one-half inch face and one-inch hole. It is lubricated by wick oilers. The outfit, as shown in the illustration, consists of two grinding



wheels, one coarse and one fine, two wheel guards, two tool rests and an electric cable fitted with attachment plug and electric switch. It can be connected to an ordinary lamp socket and is shipped ready to run. The no load speed is 3600 revolutions a minute and the net weight is 38 pounds.

Manufactured by the **Black & Decker Manufacturing Co.**, Towson Heights, Baltimore, Md. Price for 110-volt outfit, \$56; can be supplied for 220 volts at a small extra charge.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

The G-G-H "Popular" Windshield Cleaner instantly cleans three-quarters of the top windshield glass instead of a small segment as is the case with ordinary cleaners. It gives a clear view ahead as well as from the sides. A patented feature is an arrangement that releases the pressure of the squeegee when not in use, thus trebling the life of its rubber com-



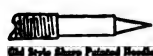
ponent; this feature also insures greater pressure when the device is in the wiping position, thus leaving the glass perfectly clean and requiring a less frequent movement.

The G-G-H Windshield Cleaner is stated to be very simple to install—can be done in less than five minutes and the device is hardly noticeable when not in use.

Manufactured by the Grigaby-Grunow-Hinds Co., 900-906 West Lake Street, Chicago, Ill. Price, \$2 complete, Catalogue No. 2010.

The C. & L. Improved Double-Needle Burner prevents, it is claimed, burner troubles in gasoline blow torches, as a blunt point is used instead of the older, more common, sharp point which was easily injured by turning the gasoline needle in too far, forming a burr, which prevented the passage of gasoline to the burner tip.

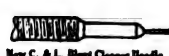
Two needles are used in the Clayton & Lambert torch, both being blunt on the points, making it impossible to burr the ends of the points or to enlarge the needle orifice.



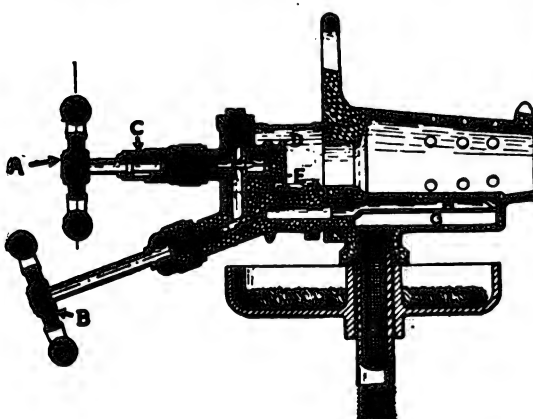
Old Style Sharp Pointed Needle



New C. & L. Blunt Shot Oil



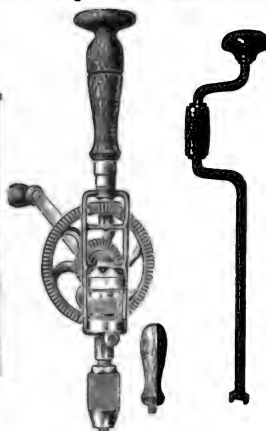
New C. & L. Blunt Cleaner Needle



The manufacturer claims that these double-needle burners have wonderful generating power, producing from 100 to 300 degrees more heat than if a single-needle valve were used and that the consumption of fuel is reduced to a minimum, this being due primarily to its improved construction and the extra long vaporizing chamber through which the gas passes, causing it to become super-heated before entering the combustion chamber.

Manufactured by the Clayton & Lambert Manufacturing Co., Detroit, Mich. Prices and literature on request.

Millers Falls Hand and Breast Drills have been designed after years of careful testing to meet the requirements of discriminating buyers throughout the automotive repair field. A large number of special tools are at present manufactured



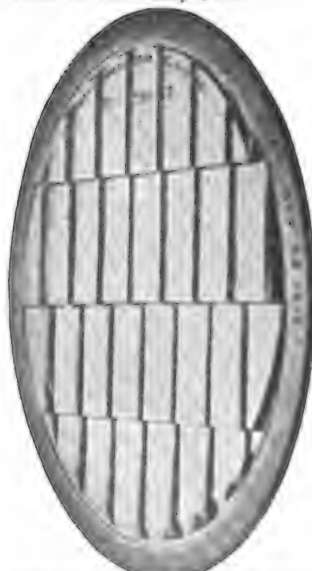
by this company for repairers in the automotive repair and manufacturing field, including punches, spring leaf spreaders, bushing drivers, assembling tools, cotter pin pullers, jacks, rim wrenches, valve grinders and hack saw blades.

Manufactured by the Millers Falls Co., Millers Falls, Mass. Prices and literature on request.

The Patterson-Lenz, designed to meet the requirements of the different state laws regarding driving lights on automobiles and trucks, is claimed to achieve the control of deflected light.

The lens projects a flood of evenly distributed light, perfectly controlled, it is stated, 42 inches from the ground, and for hundreds of feet down the roadway. Bright spots, patchy light patterns and shadows are prevented without the use of colored glass or visors.

The lens is not affected by car vibration as the bottom is made heavier than the top and for this reason has no tendency to turn in the lamp rim.



Manufactured by the Warner-Patterson Co., 914 S. Michigan Avenue, Chicago, Ill. Prices, 7 1/2 to 9 1/16 inches inclusive, \$3; 9 1/4 to 10 1/4 inches inclusive, \$3.50; 10 1/2 to 12 inches inclusive, \$4. West of the Rockies, 50 cents per pair extra.

The Holophane Headlight Lens No. 855 is designed to meet the requirements of the headlight laws in the various states and is adapted for use on the headlights of over 250 passenger cars and many of the lighter speed trucks. A special fin construction at the rear of the lens produces intense road light, preventing dis-

comfort to the approaching driver and giving a clear light for night driving.

Sizes vary from the smallest, which is 3 3/4 inches in diameter, to the largest, which is 10 1/4 inches in diameter. The Holophane lens with the fin gives a soft diffused light. The maximum beam is spread uniformly across the full width of



the road at a distance of 100 feet, it is stated, and the maker claims that the intensity at 200 feet is well above the requirements for seeing clearly at that distance. A generous provision is made on the right for ditch and curb lighting and sufficient light is thrown close to the car to give satisfactory driving conditions.

Manufactured by the Holophane Glass Co., Inc., 342 Madison Avenue, New York City. Prices and literature on request.

The Sharpe Ever-Ready Auto Windshield Cleaner Pad is the latest device to make its bow to the trade. It is made of genuine leather, handsomely embossed. The pad has a cloth which has been chemically treated in a most scientific manner and will last during the life of any average car.



The Sharpe windshield pad provides a clear vision windshield in all weather and carries the guaranty of the manufacturer. Last year thousands of accidents occurred, with consequent loss of life and property, through blurred windshields. The Sharpe pad is one of the best safety measures for damp, wintry weather, as a simple application of the pad each time a storm is encountered will absolutely produce a clear-vision glass, it is claimed. The pad is made in a most convenient size for the motorist's pocket or car pouch.

Manufactured by the Sharpe Chemical Co., 403 Stevens Building, Detroit, Mich. Retail price, \$1. Correspondence invited from car owners, jobbers and dealers.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

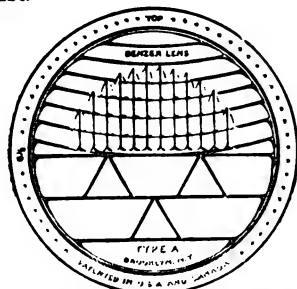
Benzer Rear-View Winddeflectors give one constant protection from the winds ahead and the cars behind, according to

and made absolutely permanent by a patented copperizing process, it is stated. A great percentage of automobile acci-

machine is back-geared 26 to one with a belt reduction of $3\frac{1}{4}$ to one, giving a total leverage, it is stated, of 70 to one.



the maker. Not only do they beautify the car, but they afford comfort to the occupants by deflecting winds, snow, rain and dust.



Benzer rear-view mirrors are actually ground into the glass of the Winddeflectors

The **Acme Visor for Windshields** has been designed with the idea in mind of standardizing a visor which will fit a large number of cars without the necessity of carrying a large stock of sizes. Universal attachments are provided which make the attaching the work of only a few minutes with the use of ordinary



tools. When not in use the visor may be folded out of the way. The Acme 42-inch model, it is stated, can be adjusted to fit 90 per cent. of the touring cars in the market. The visor is made of high-grade top material, black outside with green underside for eye protection. The fittings are all made of high-grade brass, nickel plated and guaranteed not to rust. The fittings are so accurately made that they will not rattle when fastened to the windshield.

The holding arms or brackets that fasten the visor to the frame of the windshield work on the simple hinge principle and can be moved back and forth according to the size of the windshield. The

dents which occur at night are directly traceable to blinding headlights used by motorists. As a result of this condition, state laws have been enacted which compel car owners to equip their machines with lenses that have been approved by the state.

Benzer No Glare lenses are approved and legal everywhere, it is stated. These remarkable lenses are the outcome of a life-time of scientific research and experimenting by Louis Benzer. The prismatic construction of Benzer lenses produces a brilliant white light which reveals every rut and hollow in the road—showing the ditch at the roadside and the curve in the distance at one time. There is said to be absolutely no dangerous glare.

Manufactured by Benzer Corp., Myrtle, Cooper and Webster Avenues, Brooklyn, N. Y. Prices and literature on request.

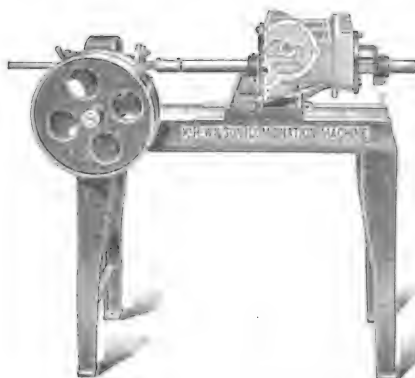
visor itself operates on a ratchet and can be lowered or raised at the wish of the driver.

The phantom view in the illustration shows clearly how the adjustable feature operates. The visor is fastened entirely to the windshield and does not interfere with lowering or raising the top of the car.

When not in use the visor can be rolled back out of sight against the top of the windshield, as easy as an ordinary window shade. The arms that hold the visor in place, when extended, can be folded flat against the drawn visor. This is a patented exclusive feature.

Manufactured by the Acme Motor Shield Corp., 1819 Broadway, New York City. Prices and literature on application.

The **Wilson Combination Machine** for Ford engines is designed to follow through the various operations from rebabbiting, boring out babbitt, aligning bearings to fit crankshaft, to running-in the bearings for the final fit. A one-horsepower motor is capable of handling the machine for boring and running-in operations as the



The same machine may also be used for reboring Ford engine cylinders with slight changes in the adjustments and the addition of the reboring tool, statement being made that it requires about $1\frac{1}{4}$ minutes to set the tool for each cylinder and about nine minutes to bore it, making a total time of 43 minutes for reboring a cylinder block. While the cylinders are being bored the operator is free to grind valves or do other work of a similar nature about the engine, a feature which should greatly reduce the actual time consumed in boring and reduces the labor cost.

Manufactured by K. R. Wilson, 10-16 Lock Street, Buffalo, N. Y. Price complete with all attachments, including inside and outside micrometers, \$365.

Gier Tuarc Steel Wheels owe their steadily growing popularity, it is stated, not only to their distinctive appearance, but also to the fact that they afford many exclusive advantages and conveniences not obtainable in any other special wheel equipment. This combination of beauty and utility is one which car owners want. Another point in favor of the Gier Tuarc is their complete interchangeability. They are equipped with the same kind of hub which the car maker uses as his standard equipment. They use standard hub caps and standard bearings which come with the car and are mounted on the car in ex-



actly the same way as wood wheels without changing any part of the car itself. Any garage man or service station—in fact, any car owner—can make the change-over to Gier Tuarc wheels in a very short space of time.

Gier Tuarc wheels take standard demountable rims. These are simply removed from the old wheels and mounted on the Gier Tuarc in the usual way with the added advantage that the Gier Tuarc clamping ring supports the rim rigidly at every point all about the circumference and prevents rim squeaks. Tire changing is as simple and easy with Gier Tuarc wheels as expert wheel builders can make it—no heavy wheels to lift—no special tools required—no special spare wheel carrier needed—no spare wheel to carry as excess weight on the rear of the car.

The two-arc (Tuarc) design of these wheels, which distinguishes them from other disc wheels, it is claimed, provides another exclusive convenience by permitting the tire valve stem to come on the outside of the wheel. The tires are inflated easily and quickly without the necessity of moving the car several times to bring the valve stems within reach.

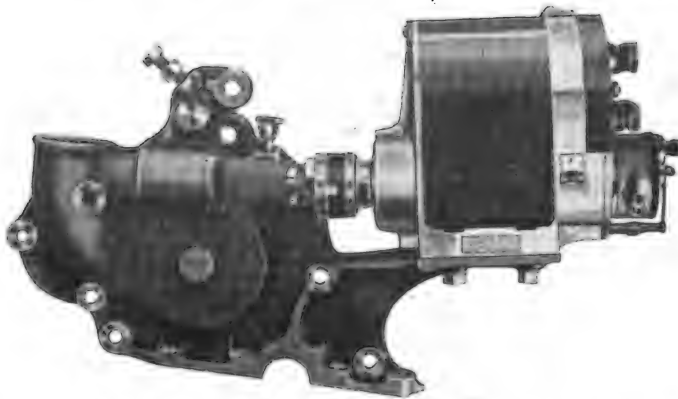
Manufactured by the Motor Wheels Corporation, Lansing, Mich. Prices and other information at request.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

The Apollo High Tension Magneto for Ford cars, designed to overcome the disadvantages of other attachments of this nature fills a long felt want. Statement is made that the Apollo will stand up under the exacting service demanded for Ford cars, and that the magneto and at-

the time the operator starts to use the gun until it is empty and that the liquid is effective where the water is useless. It is further stated that it will not deteriorate, is a non-conductor of electricity, does not freeze at 50 degrees below zero, and that the liquid will not damage ma-

of electricity, it is claimed, a process which puts the graphite in such condition that it may be filtered through standard filter paper, and will stay permanently in suspension. This material is known as a graphoid surface, which means that an

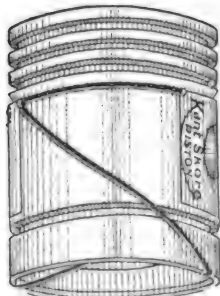


tachments are easily installed by any one in a few hours time. Nothing but the best of material is used in the construction of the magneto parts, being guaranteed against defects of workmanship and material.

To install, one simply removes the Ford timer and timing gear cover plate, also the nut that holds the cam shaft gear in place, and screws on the driving dog. The pins in the dog engage the attachment gear, making a positive flexible drive. All equipment is furnished complete and it is claimed the outfit can be installed in one hour.

Manufactured by the Apollo Magneto Corp., Kingston, N. Y. Literature on request.

Kant-Skore Pistons are designed to prevent oil pumping, plug fouling, piston slap and many other defects sometimes found in certain types of piston. They are made from a special alloy which reduces the weight materially without loss of strength it is said. Kant-Skore pistons are fitted for .0001 of an inch clearance and statement is made, that this clearance



is maintained constant at all speeds of the engine and at all temperatures. A patented spiral self-adjusting slot in the piston skirt automatically takes care of expansion and maintains the piston clearance, enabling the engine to give a smooth, silent flexibility of power that responds to every driving necessity.

Kant-Skore pistons are said to be about one-third the weight of cast iron pistons, thus eliminating much of the useless weight usually carried on a car equipped with cast iron pistons, which proves, it is stated, a saving in operation and a more powerful engine for hill work and speed.

Manufactured by the Kant-Skore Piston Co., Spring Grove Avenue, Garrard and Hopple Streets, Cincinnati, O. Prices and literature on request.

A New Fire Gun, No. 0, has a capacity of one quart, which is a convenient size to be carried in the automobile or motor truck in case of fire. The mechanism of the new Fire Gun is claimed to be of such a nature that a solid stream is given from

chinery or delicate fabrics. The use of a quart size Fire Gun at the start of a fire does much to prevent the spread of the flames and the possibility of a larger fire. Other sizes manufactured, No. 1, 1 1/4 quarts, and No. 2, with a capacity of 1 1/2 quarts.

Manufactured by the Fire-Gun Manufacturing Co., 115-19 Fourth Avenue, Corner 12th Street, New York. Prices and literature on application.

The Manley Floor Level Under Worker consists of a portable frame supporting the operating mechanism and a slanted steel track of sufficient width to allow the wheels of automobiles to be run onto them for underneath repair work.

The automobile is run onto the lower ends of the inclined tracks and is pulled into position by the winch or operating



mechanism on the steel frame. It is locked in position by a latch arrangement, which prevents the machine from backing down.

This device facilitates work underneath either end of the car and allows the work to be performed with greater ease. Many uses may be found for this device, as it can be adapted to the show room or service station. In the show room it enables the customer to examine with greater care the underneath structure of the car and in the service station work can be done to better advantage by the aid of ordinary daylight.

Manufactured by the Manley Manufacturing Co., York, Pa. Price and literature on request.

Kant-Rust is a new graphite spring lubricant which has been developed to meet the baffling conditions found by many service station repairers, in loosening rusted or frozen fitting about the car or truck such as spring leaves, clips, bolts, etc. A few drops of Kant-Rust, which is in liquid form, it is stated, quickly penetrates the rust or stiff working surface, freeing it and allowing it to move with its natural freedom of movement.

Kant-Rust is a product made by means



anti-friction metal is placed on the rubbing surfaces where it is most needed. By the Kant-Rust method the graphite goes through between the leaves, leaving a graphoid surface on each leaf, without the necessity of using a wedge or jack.

Manufactured by the Kant-Rust Products Corporation, Grand Central Palace, New York. Prices and literature on request.

The AC Quick Seller, designed as a silent salesman for the dealer provides a neat stock keeping method and storage for AC spark plugs. In design the container much resembles a large can with AC lettering on the side. The height is given as 18 inches and the diameter as 14 1/2



Chart and Stock

inches, of sufficient capacity to hold 140 AC spark plugs, enabling the dealer to carry a supply of each of the 14 best selling types and to provide instantly the correct plugs for any make of motor car, truck or tractor.

A chart showing the correct spark plug equipment for every engine is mounted in the AC Quick Seller and provides ready reference for the dealer.

Special plugs are made for several makes of engines, including the Ford, besides the regular line of plugs for every make of engine. The Ford plug porcelain insulator is provided with a special saw tooth type, which allows oil deposits to burn off, preventing carbon accumulation and short circuiting of the plug.

Manufactured by the Champion Ignition Co., Flint, Mich. Prices and literature on request.

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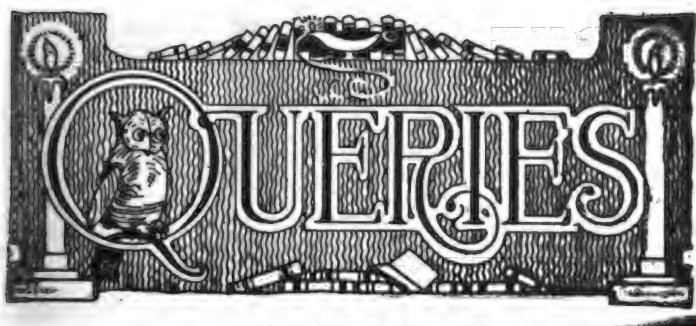
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SQUEAKING BRAKES.

(H. W. C., New Rochelle, N. Y.)

In stopping my car, the brakes squeak harshly. Why should this condition exist? I have the bands adjusted at intervals of a month or two and suppose that they are adjusted correctly.

Squeaking brakes are usually caused by either incorrect adjustment of the bands or the use of improper lining material. Improper adjustment is usually corrected by jacking up both wheels and resetting the bands of both internal and external brakes. A helper on the driver's seat assists materially in this work while the repairer makes the adjustments.

The use of improper brake lining material is a frequent cause for poor brakes and is directly due to the use of material in the band lining that offers harsh braking effect. Certain makes of lining show this more than others, but any good standard make of lining will answer the purpose. Dirt or mud will often enter the space between the lining and the drum, causing squeaks which last for a short time and then disappear with the turning motion of the wheel drum.

MIXING ETHER WITH GASOLINE.

(R. B. R., Middletown, Mich.)

I would like to use one ounce of ether to five gallons of gasoline in my Ford car and am in doubt as to whether this would prove injurious to the engine. Several of my friends are doing this and claim that they are getting results similar to using high test gasoline costing several cents more per gallon than the regular commercial grades.

Ether and gasoline mixed half and half has been in use for a long time, especially by doctors who, visiting patients on extremely cold nights, often find difficulty in starting the engine of their car after it has been standing in the cold for several hours. The ether-gasoline mixture facilitates starting under these conditions, enabling them to warm up the engine quickly. Instances are known where this has been practiced with large cars which were difficult to start

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and were sluggish in action. The engine showed more "pep" on hills and greater speed on the level. Demonstrators of used cars often use this mixture when showing a car to a prospect, as it nearly always assures a sale, the car showing up particularly well on the demonstration. Racing drivers also use the mixture for racing engines with good results.

The cost of the ether makes its use rather prohibitive as compared to gasoline, many preferring to use it only in case of emergency rather than for constant use for this reason. As most of the commercial gasoline sold by the standard companies is of sufficiently high test to be used with the Ford engine, its use with some form of humidifier which will cause the gasoline to vaporize quickly will probably solve your problem without using ether.

The chief danger from the use of ether is that it is highly inflammable, much more so than gasoline. As to damaging the engine; if a mixture of one or two ounces to five gallons of gasoline is used, it does not seem as though this small quantity would cause harm to the pistons or bearings.

HARD STEERING.

(A. K., Butler, Mo.)

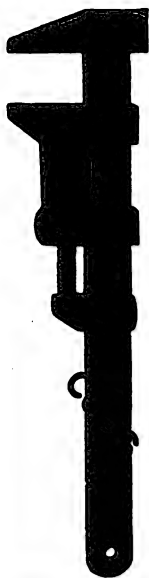
For some reason unknown to me my 1920 — steers very hard. Our local garage man who has recently overhauled the car seems at a loss to account for the hard steering, and would greatly appreciate if you would tell me possible reasons.

Lack of lubrication is one of the chief causes for hard steering. The steering knuckle pivot pins should be greased at all times. They have large surfaces which cause a heavy draft if dry and rusty. New pivot pins and bushings are often a cause of hard steering, especially if the bushings are fitted too tightly when assembled. This may be your trouble. Very thin oil mixed with kerosene will quickly penetrate to the bushings and cause the pivot pin to work itself loose. You might get results from trying this.

Adjusting the worm and worm gear, or the worm and nuts too closely will cause a hard-working steering gear. Many motorists labor under the impression that the less play present in a steering wheel the better the car handles. This rule does not follow in all steering gears, as the make-up of the steering gear mechanism varies with different makes of cars and each requires different adjustment. Study the instruction book on this point if it is thought necessary to make adjustments and allow a slight play between the worm and its parts. This adjustment will prove less tiresome while driving and will steer the car as easily if not better than if all of the play is removed.

Do not forget to remove the oil or grease plug at intervals and supply sufficient lubricant to have the steering parts working freely and easily. Tie rod ends provided with grease cups require oil at intervals to prevent wear.

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RELIEVING A SEIZED PISTON.

(H. A. L., Milwaukee, Wis.)

What do you consider the best method of loosening a stuck or seized piston in an engine cylinder. While out driving recently I was sliding along at a pretty good clip and all of a sudden one of the pistons seized, bringing the car to an abrupt stop. It came so suddenly that I barely had time to throw out the clutch to relieve the car. No damage was done to the car or power plant, however, but I was at a loss to know what caused the trouble or how to proceed to loosen it.

Stuck pistons are usually caused by either lack of oil in the engine reservoir or driving a new car which has not been thoroughly limbered up, at too great a speed while still new.

The usual method of loosening the piston is by either opening the petcock, or removing the spark plug, over the piston which is stuck and pouring in about one-half pint of kerosene and light engine oil mixed half and half. Allow this to work its way down by the piston, waiting a few minutes before trying to turn the engine over with the hand crank. Placing the gearshift lever in high speed and calling on several persons for assistance in pushing the car, will very frequently start the piston.

If the flywheel is in the open, the engine may be turned backwards, reversing the motion of the stuck piston and freeing it much more easily than if turned ahead. The action of the kerosene and oil is to form a film of lubricant over the surface of the piston sides and skirt, allowing it to be worked free.

OVERSIZE TIRES.

(H. M. W., Chickasaw, Pa.)

If I use oversize tires on my 1916 Dort car will they cause loss of power? I operate my car in a hilly section and naturally need all of the engine power available. The difference in weight between the tires I am now using (30x3½ inch) and the tires I wish to use is about 6½ pounds. Will this additional weight make any difference in the power question?

The use of oversize tires on your car should not make any appreciable difference in the engine power except to make the engine turn over somewhat slower, due to the slightly larger size of the tires. You will find that the car rides easier and that the tire mileage is increased by their use. The difference in tire weight should not make any particular difference in the power, provided the engine has good compression and delivers its full rated power. The advantages gained more than offset the disadvantages, and even though you may find it necessary to shift into second oftener, the gain will more than make up for the extra work required.

COLD WEATHER ADJUSTMENTS.

(J. A. B., Seattle, Wash.)

Is it necessary to open the needle valve adjustment or use larger spray nozzles in my carburetor for cold weather operation? My friends inform me that I should open the needle valve slightly more than for summer driving, and I find by doing so that the engine seems to overheat slightly. I use a Ford.

On the Ford car it may be an advantage to open the needle valve slightly, especially on the older models, but on the later models equipped with self-starters, having a choker button located on the dash, as well as on all other cars equipped in like manner, it is not as necessary to change the needle valve or spray nozzle adjustments, for when the engine warms through thoroughly it will be operating under practically summer weather conditions and will not require extra fuel.

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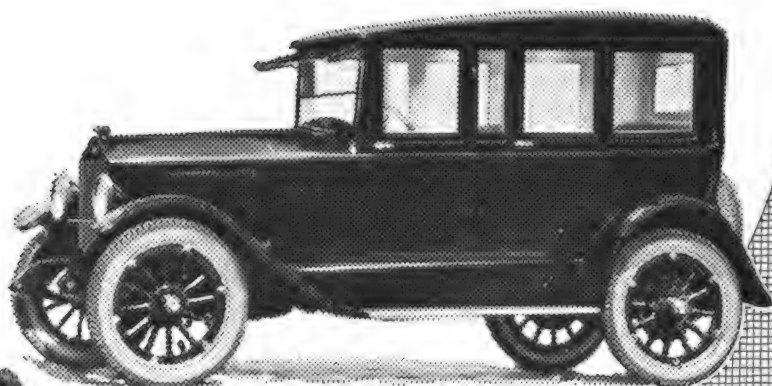
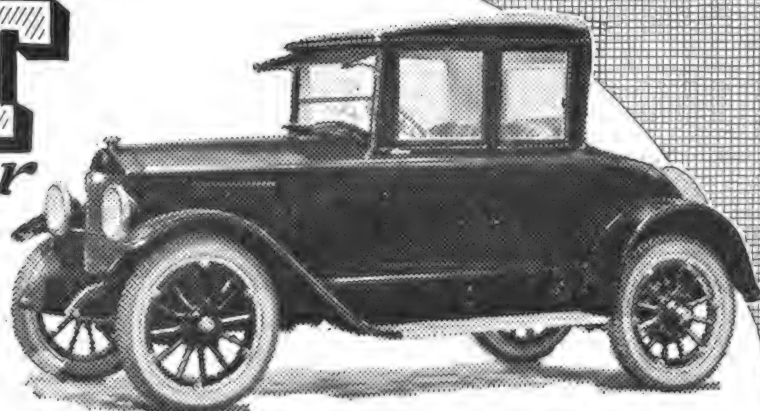
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Does this not constitute a new opportunity for greater success? We believe so and feel firmly convinced that every forward-looking dealer will agree with us especially when they examine these cars, so beautiful, so capable, and so low in cost. See them at your first opportunity—at the Boston Show. Then ask us about the Dort franchise.

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AUTOMOBILE JOURNAL

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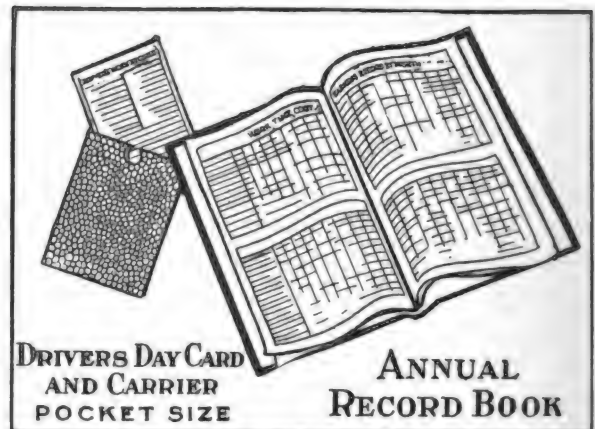
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Predict Active Selling Will Be Big Feature of Boston Show

*Public Cognizant of Substantial Values Offered
Say Car and Accessory Manufacturers
Who Look for Banner Business*

BUSINESS will be the watchword for the Boston Auto Show, which opens March 11, at the Mechanics' building. This year, more than at any time since 1914 there is every evidence that sales will have to be made on the merit of the product, and it is apparent more and more as show time draws near that the augmented number of exhibitors has this fact uppermost in mind. New England, always the first to feel a depression, is likewise the first section of the country to note a change for the better and already there is a

more hopeful tone to conditions, which indicates that the worst of the slump is over. Money is easier, wages in most cases have stayed close to the level set during the war and despite a year of stagnation, evidence points conclusively to the fact that better times are already a reality, although it is realized that the gain will be gradual. The buying public apparently is convinced that automobile prices have become stabilized, just as they are positive that the new cars and accessories show genuine equitable value.

ALL of which means that because the public has money with which to purchase and the manufacturers a product that presents a just and economical value, the Boston show should usher in a good substantial selling season—a season in which competition will be keen and intrinsic value the dominant factor.

Sales will not be made without effort—neither will they call for super-merchandising methods. This is as it should be. Exceptional prosperity presents no lasting good effects to any industry. In the first place the manufacturer, very humanly, rests satisfied with his product when the people are standing in line to purchase it, and this means that progress along the lines of efficient and economical design is apt to be slow. In the second place the period of easy pickings disorganizes the salesman and the manufacturer in much the same way that a soft life will react on the athlete. Furthermore, there was never a business boom that was not followed by a depression, which in many cases numbered its financial failures by scores and disrupted economical conditions for months before it could be surmounted and the normal stride again gained.

Therefore, because business conditions are even slightly on the mend the automotive industry is encouraged, and the 10 months should see a return to normal

in the building and merchandising of good-value motor cars and accessories.

The New York and Chicago shows, in great measure have proved successful. It is true that price changes may have oc-

casioned some unrest among prospective buyers at the Gotham exposition, although it is highly probable that sales were merely postponed rather than entirely lost. The show did one thing, the value of which cannot be estimated in dollars and cents in that it emphasized the rare values of the 1922 product in a manner that has left no doubt of their superior worth in the mind of the motorist. The Chicago show was marked by better selling business conditions, if reports are correct, and there certainly is every reason to think that the Boston show, even as Manager Campbell has said, will inaugurate a period of genuine business. So much for the business end of the exposition, although one must admit that this phase transcends all other attendant features.

Many Exhibitors.

According to the latest reports from Boston, made two days before the show, there is every reason to believe that there will be a greater number of car exhibitors than at either the New York or the Chicago shows, although this has not been definitely stated as a fact by the management. It is certain, however, that the accessory exhibitors at the show will greatly outnumber those seen at any other event of like nature, just as it is equally true that no better values in accessories have ever been offered.

The dealer and manufacturer in every



Chester I. Campbell, Manager of Boston Automobile Show.

branch of the automotive industry has never shown greater interest in a show than is noted this year, and this is proven by the fact that many more car, truck and accessory manufacturers and dealers applied for space than could be accommodated. As it is the entire floor space of Mechanics' hall has been allotted for more than two months, in addition to which there will be a particularly representative display of fine cars in the ball room of the Copley-Plaza.

Rapid Growth of Industry.

The following figures in regard to shows of the past will serve as a method of gauging the very rapid growth of the industry:

In 1912 107 passenger cars were shown and there were 200 accessory exhibitors. In 1915 the number of pleasure car showings was 71, of commercial wagons, 34, and of accessories, 250. The figures for 1916 were, 76 passenger car exhibitors, including two of electric vehicles and one of steam, 33 truck makers and 175 accessory manufacturers. In 1917 139 different makes of automobiles were seen, divided into 89 passenger cars and 50 trucks, trailers and tractors, while the accessory exhibitors numbered 170. The show for 1918 beat all former records, with a total of 364 exhibitors, consisting of 80 different makes of passenger cars, 62 of trucks and 222 demonstrators of accessories. The total number of cars, trucks and chassis shown that year was over 460, and their combined value was estimated at \$1,500,000. In 1919 the exhibitors of passenger cars numbered 70, of commercial vehicles 56 and of accessories 350. The total value of the passenger cars, trucks and accessories gathered together for 1920 were estimated by Manager Campbell to be nearly \$5,000,000. Figures for 1921 were not as large as this, although they closely approached it.

While no figures are available for 1922 there is positively no doubt that this show will surpass any other, although considering that prices have declined sharply in the last year, it is entirely probable that the actual dollars and cents value on paper will be slightly smaller than that of 1921.

Other Show Week Events.

Show week in Boston will be signalized by many gatherings of a business and social nature by bodies allied with the automotive industries, such as annual meetings, conferences, conventions

AUTO MORTALITY LOW.

AT THE outset of 1921 various authorities agreed that at least 600,000 automobiles would be scrapped during the year. National Automobile Chamber of Commerce and other production figures for the year, compared with the increase in registrations, show this total to be well under the 400,000 mark. Cars are delivering exceptional service.

Instead of being discarded at the end of the estimated five-year period, they are delivering at least six years' service. The total production of cars and trucks in 1921 was 1,575,686. Registrations increased 1,229,023. It is reasonable to believe that the difference between these two figures, or 346,663, represents the number of cars that were junked last year.

Hotels are booked to capacity far in advance, and thousands who will be in Boston that week will be forced to resort in lodging houses or to rely on the hospitality of friends. Restaurants and theaters, department stores and retail merchants generally will do a tremendous business. The visitors come prepared to spend liberally and millions are thus dropped into the coffers of the Boston merchant as a result of the Boston automobile show.

Many of the big selling agencies outside the automotive industry have found it profitable to make it the week to assemble their selling forces there for their annual conferences when plans are consummated for the year's campaign. The auto show is the lure.

Motor Truck Exhibitors.

Motor trucks will have a more prominent place than ever before at this event, and the excellent showing will emphasize the great advance that has been made of late years in this utilitarian branch of the motor vehicle. These will, for the most part, be grouped on the basement floor of the Mechanics' building, and will display the fact that chassis and running gears have been strengthened, and body designs have been developed to meet the requirements of the various lines of business in which the vehicles are used.

and banquets, and there is no doubt that there will be such a fore-gathering of representatives from the eastern section of the country as has seldom been seen at the Hub. Nor is this by any means confined to the interests directly concerned in the auto show. Show-time has come to be recognized as Boston's greatest business week, a veritable spring time awakening to the strenuous activities of a new season.



Mechanics' Building, Home of the Boston Auto Show, Is One of the Largest Structures of Its Kind in the Country.

Exhibitors at the Boston Automobile Show

| Name | Address | Name | Address |
|--|---------|--|---------|
| Able Mfg. Co., Inc., 5 Columbus Circle, N. Y. | | Eastern Tractors Co., 92 Mass. Ave., Cambridge, Mass. | |
| Acme Sales Co., 100 Boylston St., Boston. | | Eggleston Supply Co., 259 Franklin St., Boston, Mass. | |
| American Chain Co., Inc., Bridgeport, Conn. | | Harry Eisner Co., 907 Boylston St., Boston, Mass. | |
| American Storage Battery Co., 326 Newbury St., Boston. | | Elcar Co. of Boston, 1039 Commonwealth Ave., Boston, Mass. | |
| The F. A. Ames Co., Owensboro, Ky. | | | |
| Anderson Spring Lubricator, 41 Lansdowne St., Boston. | | Fay Co., C. E., 730 Commonwealth Ave., Boston, Mass. | |
| Anthony Co., Frank P., 5-7 Brighton Ave., Boston, Mass. | | Flaherty Co., W. H., 74 Cummington St., Boston, Mass. | |
| Apco Mfg. Co., Providence, R. I. | | Flentje, Ernst, 1643 Cambridge St., Cambridge, Mass. | |
| Apperson Motors, Inc., 1048 Commonwealth Ave., Boston. | | Flexlume Sign Co., 168 Dartmouth St., Boston, Mass. | |
| Arrow Grip Mfg. Co., Inc., Cooper St., Glens Falls, N. Y. C. | | Ford Motor Co., Cambridge, Mass. | |
| Ashton-DeVeer, Inc., 159A Mass. Ave., Boston, Mass. | | Fox Motor Car Co., 7th & Grange Ave., Philadelphia, Pa. | |
| Atmus Co., E. Boston, Mass. | | Franklin Motor Car Co., 616 Commonwealth Ave., Boston. | |
| Autocar Sales & Service Co., 642 Beacon St., Boston, Mass. | | Franklin, M., 28 School St., Boston, Mass. | |
| Automotive Gear Works, 291-97 Marietta St., Atlanta, Ga. | | | |
| | | Garage & Auto Supply Co., 33 Traverse St., Boston, Mass. | |
| Babcock Sales Co., 1123 Commonwealth Ave., Boston, Mass. | | Gill Mfg. Co., 8300 S. Chicago Ave., Chicago, Ill. | |
| Baby Hammock Co., 18 Tremont St., Boston, Mass. | | Green & Swett Co., 521 Boylston St., Boston, Mass. | |
| Baker Motor Sales Co., 400 Mass. Ave., Boston, Mass. | | Grow Tire Co., 323 Columbus Ave., Boston, Mass. | |
| The Bassick Mfg. Co., 361 W. Superior St., Chicago, Ill. | | | |
| Beacon Motor Car Co., 660 Beacon St., Boston, Mass. | | Hall Motor Co., 971 Commonwealth Ave., Boston, Mass. | |
| Bearings Specialty Co., 169 Massachusetts Ave., Boston, Mass. | | Hampden Motor Truck Corp., 276 High St., Holyoke, Mass. | |
| Becker Stutz Auto Co., 677 Beacon St., Boston, Mass. | | Harnette Lubricating Co., 100 Boylston St., Boston, Mass. | |
| Beckley-Ralston Co., Inc., 234 West 54th St., N. Y. C. | | Harris Co., Inc., 89 State St., Boston, Mass. | |
| Biflex Products Co., Waukegan, Ill. | | Hart Co., A. T., 985 Commonwealth Ave., Boston, Mass. | |
| Blanchard, H. H., Jefferson, Me. | | Hartford, Inc., Edward V., 35 Warren St., N. Y. C. | |
| Boston Auto Top Co., 100 Mass. Ave., Boston, Mass. | | Harvey, J. C., 218 Eliot St., Boston, Mass. | |
| Boston Blacking Co., E. Cambridge, Mass. | | Hassler, Inc., Robert H., Indianapolis, Ind. | |
| Boston Buick Co., 940 Commonwealth Ave., Boston, Mass. | | Henley Kimball Co., 652 Beacon St., Boston, Mass. | |
| Boston Oldsmobile Co., 940 Commonwealth Ave., Boston, Mass. | | Henshaw Motor Co., 989 Commonwealth Ave., Boston, Mass. | |
| Bowman Co., J. W., 81 Massachusetts Ave., Boston, Mass. | | Hillman Auto Supply Mfg. Co., 98 Mass. Ave., Boston, Mass. | |
| Boynton Appliance Co., 126 Massachusetts Ave., Boston, Mass. | | Hinchcliffe-Patterson, 900 Commonwealth Ave., Boston, Mass. | |
| Brockway Motor Truck Co., Cortlandt St., N. Y. | | Holmes Motors, Inc., 965 Commonwealth Ave., Boston, Mass. | |
| Brock-Skinner, Inc., 10 Bridge St., N. Weymouth, Mass. | | Howe & Co., 883 Boylston St., Boston, Mass. | |
| Brown Mfg. Co., Arthur S., 10 High St., Boston, Mass. | | Hudson Motor Specialties Co., 1 S. 21st St., Philadelphia, Pa. | |
| Brunner Mfg. Co., Broad & Gilbert Sts., Utica, N. Y. | | Hunt, E. C., 3 Arborway Ct., Forest Hills, Mass. | |
| Bunting Brass & Bronze Co., 715 Spencer St., Toledo, O. | | Huskee Tool Mfg. Co., 586 Public St., Providence, R. I. | |
| Burditt & Williams, 160 Federal St., Boston, Mass. | | | |
| Burton-Rogers Co., 755 Boylston St., Boston, Mass. | | Instant Products Corp., 21 Cambria St., Boston, Mass. | |
| | | International Harvester Co., 43 Somer. Ave., Somerville, Mass. | |
| Cadillac Automobile Co., 664 Commonwealth Ave., Boston. | | | |
| Campbell Motors Corp., 714 Beacon St., Boston, Mass. | | Jackman-Jameson Motor Co., 1027 Common. Ave., Boston. | |
| Canterbury, Inc., Geo. W., 867 Commonwealth Ave., Boston. | | Jackson Electric Co., 711 Beacon St., Boston, Mass. | |
| Carr Fastner Co., 31 Ames St., Cambridge, Mass. | | Jackson Motors Co., 685 Beacon St., Boston, Mass. | |
| Carroll Mfg. Co., 683 Massachusetts Ave., Arlington, Mass. | | Johnson, Arthur G., 45 Lansdowne St., Cambridge, Mass. | |
| Case Threshing Machine Co., J. I., 29 Stillings St., Boston. | | Johnson Automobile Lock Co., 4121 Park Blvd., St. Louis, Mo. | |
| Central Automobile Tire Co., 113 Stamford St., Boston, Mass. | | Judd, John L., 685 Beacon St., Boston, Mass. | |
| Champion Ignition Co., Flint, Mich. | | | |
| Champion Spark Plug Co., Upton Ave., Toledo, O. | | Kant-Rust Products Corp., Rahway, N. J. | |
| Chandler Motors of N. E., Inc., 714 Beacon St., Boston, Mass. | | Kelley-Springfield Motor Car Co., 595 Comm. Ave., Boston. | |
| The Class Journal Co., 230 W. 39th St., N. Y. C. | | Kelsey Motor Co., 733 Boylston St., Boston, Mass. | |
| Cleveland Pneumatic Tool Co., 3738 E. 78th St., Cleveland, O. | | King Motors, Inc., 650 Beacon St., Boston, Mass. | |
| Collins Motor Car Co., 1037 Commonwealth Ave., Boston, Mass. | | Kress & Son, O. F., 102 Concord St., Lawrence, Mass. | |
| Commerce Truck Co. of N. E., 5 Brighton Ave., Boston, Mass. | | Kwix Co., 155 North Washington St., Boston, Mass. | |
| Connell & McKone Co., 109 Brookline Ave., Boston, Mass. | | | |
| Connell Co., W. J., 574 Commonwealth Ave., Boston, Mass. | | La-Lo Chemical Co., Friendship St., Providence, R. I. | |
| Cooper, J. H., 501 Fifth Ave., N. Y. C. | | Larco Wrench & Mfg. Corp., 7800 Woodlawn Ave., Chicago, Ill. | |
| Cotton Motor Co., 922 Commonwealth Ave., Boston, Mass. | | Leghorn Motors Co., 860 Commonwealth Ave., Boston, Mass. | |
| Coward Auto Supply Co., 222 Eliot St., Boston, Mass. | | Lexington Automobile Co., 783 Boylston St., Boston, Mass. | |
| Crew Levick Co., 2nd & Munroe Sts., E. Cambridge, Mass. | | Linscott Motor Co., 566 Commonwealth Ave., Boston, Mass. | |
| Cunningham Son & Co., 1117 Commonwealth Ave., Boston. | | Loconobile Co., The, 700 Commonwealth Ave., Boston, Mass. | |
| Curtis Pneumatic Mch. Co., 1502 Kienlen Ave., St. Louis, Mo. | | Long Co., R. H., Fountain St., Framingham, Mass. | |
| Cutler, Harry H., 263 Northampton St., Boston, Mass. | | Lovejoy Mfg. Co., 39 Brighton Ave., Boston, Mass. | |
| | | Lowell Anderson Motor Co., 56 Thorndike St., Lowell, Mass. | |
| Davis & Co., W. E., 4 Meadow St., Providence, R. I. | | | |
| Davis Chemical Mfg. Co., 306 Warren Ave., Brockton, Mass. | | Mack Motor Truck Co., 185 Mass. Ave., Cambridge, Mass. | |
| Davis-Lynn Storage Battery Co., 165 Commercial St., Boston. | | MacLite Storage Battery Co., 62 Stanhope St., Boston, Mass. | |
| Davis-Watson Mfg. Co., 9-11 Foundry St., Nashua, N. H. | | MacAlman, J. H., 98 Brookline Ave., Boston, Mass. | |
| DeLite Mfg. Co., 9 Cawfield St., Boston, Mass. | | MacBride & Co., Inc., Geo. W., 6 Columbus Ave., Boston. | |
| DeLuxe Specialty Co., Inc., 176 Brookline Ave., Boston, Mass. | | MacMillan, L. W., 98 Brookline Ave., Boston, Mass. | |
| Detroit Pressed Steel Co., 6660 Mt. Elliott Ave., Detroit, Mich. | | Maguire Co., J. W., 745 Boylston St., Boston, Mass. | |
| Dickerson, C. A., Fisher Bldg., Chicago, Ill. | | Malton Specialty Co., 171 Massachusetts Ave., Boston, Mass. | |
| Donovan Motor Car Co., 626 Commonwealth Ave., Boston. | | The Manley Mfg. Co., Cor. W. King & Herman Sts., York, Pa. | |
| Dunbar-Sanders, Inc., 655 Beacon St., Boston, Mass. | | Mann Motor Car Co., 32 Brighton Ave., Boston, Mass. | |
| Dutton Motor Co., F. A., Ball Square, W. Somerville, Mass. | | Marko Storage Battery Co., 1402 Atlantic Ave., Brooklyn, N. Y. | |
| Dyer Co., The, 155 Brookline St., Cambridge, Mass. | | | |

(Continued on Page 42.)

British Motor Car Design Development

ANALYSIS by the Automotive Division of the Department of Commerce of recent motor car development in the United Kingdom show that the British manufacturers are concentrating on the smaller, lighter and relatively cheap cars capable of being run at a low operating cost. Many manufacturers, who before the war refused to consider anything but high-powered, luxury productions, are now building lighter cars, in some cases miniature models of the heavier vehicles. Other companies, which have never

manufactured big cars, offer entirely new small designs, or improved types of their old makes. The movement amounts in its broad outlines, to a determined effort on the part of British manufacturers to meet competition in the cheaper automobile, and to stimulate a home industry which has suffered severely from the effects of the general trade depression. Prices are figured on the narrowest margin of profit, and considering the industry as a whole, have decreased about 25 per cent. during the past year.

THESE cars are not cheap in the sense that they are mass-produced, or of inferior material or workmanship. On the contrary, the highest mechanical skill is employed in their construction with the object in view of compressing into the smallest possible space the greatest amount of efficiency. Hitherto the cheaper grade of motor car has been almost a foreign monopoly in the United Kingdom, but the British maker is now beginning to consider the large potential market which can only be tempted by cars of low cost. This low cost does not mean entirely the initial price paid for the car, for in Great Britain particularly, careful consideration is given to running costs and maintenance charges. It is argued that any advantages which certain of the lower priced foreign cars, especially American, have over British light cars, are superficial when running costs for foreign makes are so much greater that any saving in the purchase price at the outset is swallowed up in the first 12 months' running.

Heavy Tax on High Horsepower.

As all gasoline is imported into the British Isles, the cost is several times in excess of that to which the American owner is accustomed, so the British purchaser weighs very carefully the item of fuel consumption before buying a car. Prior to 1921 gasoline was subject to an import duty, but the taxation by the horsepower of motor cars has replaced the former customs duty on such fuel. This license tax, which is £1 per horsepower annually on passenger cars, has been one of the chief factors in creating the strong demand for motor cars of from eight to 12 horsepower. To determine the horsepower the British treasury rating is calculated by squaring the cylinder bore, multiplying by the number of cylinders and dividing the result by 2.5, the length of the piston stroke being ignored.

Motorcycle Side-Car Developments.

For motorcycles and cycle cars, however, high horsepower is not a disadvantage, as this class of motor vehicles is taxed on the basis of weight, not horsepower. Accordingly, the American motorcycle has gained wide popularity in the British market, not only on account of its relatively high power, but also because of ease and readiness of accelera-

tion, all around simplicity of mechanical operation and general excellence. The development and perfection of the side-car combination, not only one and two-seater open side cars, but two and three-passenger; closed, landaulette, side car taxi styles as well, is most interesting new feature in this field. The use of the motorcycle and side car is very widespread in England, where the distances are short and the roads excellent, and British manufacturers enjoy the unique position of being able to satisfy the purchaser, as no others have done, in the way of comfortable arrangement and luxurious appearance.

Four-Cylinder Cars Most Popular.

No move toward standardization has been attempted as yet on the British light car, and each maker presents features which are peculiar to his own vehicle. In general, however, the four-cylinder engine is considered the most popular of any type in England, and improvements in material and design are reacting strongly in favor of overhead valves, which give greater accessibility and efficiency. The two-cylinder engine appears to be becoming a formidable rival, however, to the four-cylinder for use with light cars, as both air and water cooled prove quieter and better balanced than the fours.

Specifications of Construction.

In the lightest types of car quarter-elliptic spring suspension is very popular, but in the middle weight class semi-elliptic and three-quarter springing is still the most favored in England. Back-screens are becoming more popular in four-passenger cars, and considerable improvement has been made in protecting passengers from the weather even in two-seater machines. The wooden wheel has been practically displaced by the disc, wire and steel-spoked types. Apart from the lightest of light cars, some form of electric starting is now standardized, but the power driven tire pump is almost unknown as a standard part of equipment. Electric lighting is almost universal, but storage battery ignition is not so popular as it should prove with better service station facilities and more familiarity upon the part of the public. The transmission brake is being dispensed with almost entirely, both brakes now being usually on the rear wheels, although brakes on all four

wheels are gaining rapidly in popularity. Overhead valves are gaining ground, and the spiral bevel appears to be ousting all other forms of final drive. The three-speed transmission is returning to favor, and the gear and brake controls are being placed to the right of steering post, most of the cars in England being right hand drive. In short, British motor car manufacturers are making every effort to improve chassis details, to cut down weight wherever possible and to give increased engine and transmission efficiency.

Do Metals Tire?

THE question "Do metals get tired?" which has puzzled scientists for hundreds of years, is being studied by a committee of the National Research council with the aid of board of Engineering Foundation. The scientists have long known without understanding precisely why, that every once in a while a piece of tempered steel or stout forging will break down without apparent reason.

The solution of this question, the engineers say, is awaited with eagerness by American aviation experts seeking, through the strengthening of all materials that go into the makeup of airplanes, to make military flying as safe as possible.

"The air service of the United States army is negotiating for an extension of the research, and it is possible that certain industries will support additional experiments in other kinds of metal," says an announcement of the Engineering Foundation, describing results obtained from the study of fatigue in metals. Metal experiments have been made at the engineering experiment station of the University of Illinois by Prof. H. P. Moore, and a complete report of the researches is soon to be published dealing with the limits of endurance of various metals under many repetitions of stress.

Manufacturers contributed test specimens of steel to the experiment and under known conditions. These are being subjected to millions of repetitions or changes of stress. Knowledge of great practical utility has been gained.

Driver Should Not Neglect Oiling

*Also Important That He Should Know Proper Kinds
of Lubricant to Use—Life of Car Depends
Largely on This Important Feature*

IT HAS been aptly said that the importance of lubrication to the proper operation and continued existence of the motor car cannot be overemphasized. One who follows the developments in the automobile field might be tempted to think the present generation of car owners had been thoroughly educated in this, but then he finds one making some mistake in lubrication that shows that many car owners still do not know the real meaning of the subject.

For several years past few motorists have used grease as a lubricant for their transmission, yet some car owners who ought to know better still employ this heavy lubricant in this location.

GREASE cannot flow to the bearing surfaces and in the transmission gears cut a clean path through the grease when it is cold and run practically unlubricated thereafter.

In addition grease has the unfortunate characteristic of carrying dirt and foreign matter that it may pick up. It has distinct drawbacks as a lubricant in any location, especially in cold weather, when it ought never to be used. In winter the grease is almost certain to become packed against the walls of any case in which it is used, while the gears operate entirely dry.

When grease is used in cups it has the characteristic of getting hard so that the cup cannot be turned down properly and very little lubrication gets to the bearing surface for which it is intended.

On practically all cars of any but the most recent vintage, grease cups are fitted at various locations. If the owner desires to substitute oil as a lubricant for the grease he has practically to replenish the cups every day. In many cases this would be worth the increased labor.

Mechanical Oilers Popular.

On the other hand, it may be possible to replace the grease cups with large oil cups having gradual feed. Some of the newer car models have been designed with central lubricating points and with wick oiling devices, which require replenishing only once or twice a season. At any rate the substitution of oil for grease for almost any lubrication service will be a benefit to the parts affected.

Naturally different parts of the mechanism require different lubricants, that is to say, different grades of oil. For the gears, the transmission, differential and rear axle a heavy oil will be the most satisfactory lubricant. Other parts will do better on a cylinder oil. For the average car two grades of oil will pretty well take care of all the lubrication needs.

The last year or so has seen a number of extremely ingenious oil cups offered to the motoring public, some of them embodying a gradual feed, achieved by means of constricted passages that allow the oil to leak out only by degrees. Others employ what is known as wick feed, in which the oil is carried up in a wick and fed gradually to the part need-

ing lubrication. For such places as the shackle bolts of the springs, the cross shafts of the brakes, the universal joints, in some types, this makes a very satisfactory arrangement.

Oil for Universal Joint.

It has always been the custom to lubricate universal joints by means of grease or graphite, because there is great difficulty in keeping oil in the joint. This moves with great rapidity when the mechanism is in operation and needs the most effective lubrication. Recently it has been found possible to lubricate the universals by means of oil fed through wicks. In many cases this change would have to be the result of altered design, which the manufacturer is loath to do because of the cost.

Wick feed has the double advantage of being economical as well as efficient. In operation the oil travels up the wick by

capillary attraction, just as it does up a lamp wick, and is discharged upon the surface requiring lubrication. The oil spreads itself over the whole surface and really this method is the next best thing to having the parts run in oil. The wick oil cup does not require frequent filling, and another advantage of the system is that dirt or foreign matter, even if it is present in the oil, cannot make its way to the bearing surface.

Lubrication a Problem.

The question of obtaining adequate lubrication is one to which engineers have given and are giving almost constant thought. Some of them have even attempted the negative solution of the problem by employing bushings made of wood or of metal that do not require lubrication.

In most of these latter there is a certain proportion of graphite, which is intended to act as a lubricant, just as the soapstone griddles our grandmothers used to have would bake cakes without the application of outside grease. These lubricantless bearings serve very well for certain parts of the car's mechanism, but where there is intense movement they are scarcely up to the work. However, at that, they probably are better than grease cups, especially those that are never turned down by a careless owner.

Many engineers believe that eventually we shall have a car that embodies a single lubrication system, feeding all parts of the mechanism. In that case all the owner would have to do would be to fill up a single central reservoir. In fact, a car approaching that ideal was exhibited at the shows a couple of years ago.

SPANISH BUS CONCESSION.

The concessions for bus lines in Madrid have now been granted to the French. The French Schneider Co. is authorized to operate practically the entire bus service in Madrid between the principal points of the city, including the chief railway stations. This company engages to put 30 busses in operation within 30 days and to have 100 in circulation within three months, all to be inspected by the municipal authorities before entering service. Additional busses are promised for the public on festive occasions.

"FAR FROM THE MADDING CROWD."



Scene in National Forest, Colorado.

Cars at Boston Show Designed to Please Discriminating Purchaser

Season's Newest Offerings Embrace Wide Range of Models That Combine Style, Beauty, Power and Speed with Comfort, Economy and Safety.

(By CLEVELAND GRAY.)

HE WHO visits the Boston Show—even though he has no fixed intention of purchasing and goes merely to “look around”—will have hard work to resist opening his pocket book and riding off in one of the numerous offerings of 1922. The new cars offer everything that the most discriminating purchaser can ask for; accessibility, economy, comfort, power, speed, durability and style, all combined into the one quality of value to an extent that has never been seen at any prior exposition in the Massachusetts city. And a careful examination will prove the truth of this somewhat superlative statement.

WHAT does the car buyer want? It is far easier to describe what a person should look for when buying an automobile than it is to ascertain just what the person seeks. The sentence is somewhat ambiguous at first glance, but the car salesman of experience knows the truth of it. He knows what qualities should appeal to the buyer, but never is sure of his ground until he has



Driver's Compartment. Note Ample Room.

acquainted himself thoroughly with the prospect's personal desires and prejudices.

Speaking in an abstract way, value is the paramount desire of the car purchaser and mechanical dependability is the specific quality which most expresses that desire, since a car that cannot be kept in operative condition has no real value to the purchaser. With this in mind the cars displayed at the Boston

show should please the prospect. Ranking close with mechanical efficiency in the mind of the average buyer is the quality of economical operation and here again the new cars score.

Practically all want a car of good appearance, but their ideas as to what constitutes “good appearance” are very apt to agree with the size of their bank rolls.

Nearly all insist upon ease of operation. Even those who employ chauffeurs like to have machines that they themselves can handle occasionally, and the simpler the mechanism the better. They also appreciate the fact that ease of operation adds to safety.

The reputation of the manufacturer is usually the guarantee of mechanical dependability. Fortunately, the buyer takes little risk regarding this phase, as nearly all of the automobiles made by reliable manufacturers may be depended upon to give good service.

A person wants a car that he can afford to run. A man with a modest income realizes that even though he may be able to buy a high priced car, the operating cost will probably be more than he can consistently expend.

Persons with liberal incomes naturally prefer cars that will inspire pride of ownership. They usually want something that is “a little different” from most other cars, seeking individuality in their automobiles the same as they do in their clothing. As body styles keep changing, the custom body craft has attained a remarkable growth. Those who can afford to do so are very apt to buy a high grade chassis and have a body built to order.

Riding comfort is sought in all cars, no matter how they are priced.

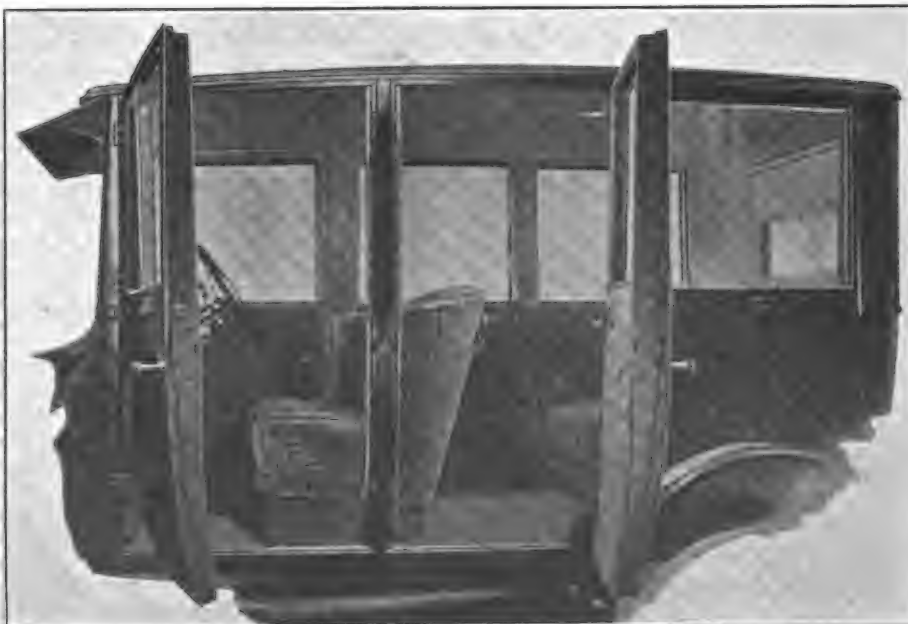
A metropolitan automobile dealer, when asked what the majority of buyers lay stress on in making their selection of a car, said:

“The great majority of buyers are well up on motor car construction. They know what constitutes a good car and they have a general idea of what the best specifications cost in comparison with cheaper designs.

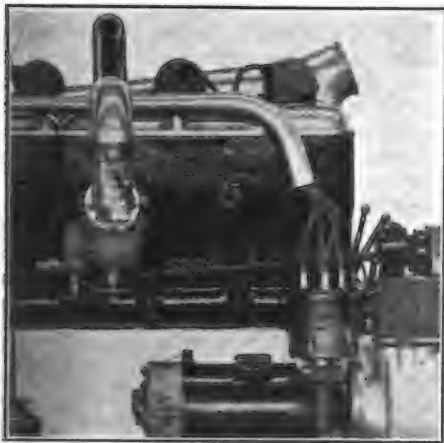
“Power is an essential—there can be no excuse for lack of it. Comfort speaks for itself. The springs, cushions, grade of leather and roominess come in for close examination.

“Strength is all important to the cost of operation. Simplicity of control is essential, as most cars are driven, at least part of the time, by women.

“Everybody wants a good looking car—one which calls for no apology. I



Modern Refinements Show Wide Doors and Luxurious Interiors.



New Models Feature Accessibility.

know all people consider the factor of appearance as well as the other elements mentioned before the purchase price is considered.

"No one wants to pay more for satisfaction than is necessary, but the buyer requires performance, appearance and durability first. The price he has to pay for these essentials is a secondary consideration."

A manufacturing manager, who was interviewed along similar lines, agreed that the average automobile buyer knows motor car design. "He knows good car lines and knows when he is getting comfortable upholstery and satisfactory finish," said this manager.

He said that in no other industry was the public better informed upon what it wants.

"If auto manufacturers had been disposed to camouflage their products," he continued, "they could not have got away with it. In fact, those few concerns that have tried it have failed."

"Fortunately for the industry and the public, motor car makers have been alert to meet the demand almost as soon as expressed. Automobile makers have always shown a typically youthful zest for improvement."

"That attitude, mated with the constructive understanding of the public, has, in a very few years, brought the motor car—a piece of machinery subjected to previously unknown and unprecedented hard service—to a standard of performance that is little short of miraculous."

"The automobile buyer is buying transportation. The more perfected the car is in performance, comfort, appearance and utility, the more satisfactory the means of travel."

"It's just the same when you take a railroad trip—will it be the slow train or the limited? Will you sit in the day coach or the chair car? It is just a matter for you to decide how you want to travel and the time and frame of mind you want to arrive in."

The manufacturer also argued that transportation in one's own automobile is but slightly more expensive than that furnished by traction companies.

"Per mile, a motor car may cost a little more than the street car or train fare would be in making the same journey," he said. "But the pleasure at this cost

for a mile of motoring is so cheap in comparison to the joy of it that it is perfectly fair to charge a small part of the pure transportation rides to the amusement pages in the family ledger.

"In doing this the costs of maintaining and operating an automobile are in competition with both transportation prices and pleasure expenditures.

Here are the ideas voiced by a metropolitan dealer who has been in close contact with buyers for many years:

"What the average prospect wants is the best value for the money he is going to spend. And he sets down his wants in the proper proportion, too. In getting value he looks first, I believe, at performance. The shiny exterior and beauty of an automobile cannot lure him from his quest for the car that can deliver the goods."

"By performance, I mean that he wants a car that will serve him well and faithfully. In getting this he secures utility. He wants to be shown that the car he buys will stand up under ordinary conditions—and under extraordinary ones."

"Secondly, he wants economy in operation. Initial cost is subservient to this, I believe. But economy in operation has a string attached to it; it must be economical without a sacrifice of service and utility. Thus far, he will go in economy and no more."

"Next, after economy in operation, comes design from the standpoint of care and the ability to 'get at' all parts that need attention. Bitter experience has taught too many motor car drivers the expensive results of making some minor adjustment on a badly arranged car, to ever let them select a new model without keeping the accessibility of its parts well in mind."

"Design from the purely mechanical side in matters of power and strength is covered in the demand for service and stamina."

"Finally, the average buyer wants comfort and convenience. He is not satisfied with any of the foregoing unless

this last requirement is satisfied perfectly.

"I have mentioned these points in the order of their relative importance, not as in any way suggesting that the car which meets all but one will ever be selected by the average prospect. For the car that meets all but one of these demands is as badly off as if it met none of them."

"The point is in the way in which the average prospect goes about making his selection. His thoughts, I believe, come in the order named."

"Fortunately for both buyer and salesman, there are motor cars which meet all of these requirements. Moreover, they meet one other—that of initial price. They offer the average prospect all that he demands and more at a price which is well within his ability to buy and which is truly low in comparison with what is given for it."

Another dealer fails to tell what the average buyer looks for, but he gives his opinion as to what features should be sought. He says:

"Depth of upholstery and resilient springs are not the only essentials to comfort. Power, first of all, heads the list of what I consider the most important of all motor car essentials that make for comfort."

"The driver who has to give up his whole time to the operation of his car, with his hand constantly on the gear shift lever certainly cannot remain in a very happy state of mind."

"What is wanted to make the driver as comfortable as the other members of the party is a road car—a car that can be driven without fussing round with pedals and levers."

"A comfortable car must have beauty in every line, with a finish that is rich and permanent. Not that exterior design and finish give the body rest, but they do impel pride in ownership and that means mental comfort."

"Narrow doors are inconvenient and,

(Continued on Page 16.)



Long Spiral Springs Incorporated in Cushion Enhance Comfort of Rider.

Tires Composed Largely of Vegetable Matter

RUBBER tires in the period of one generation have almost completely replaced tires made from other materials on bicycles, motorcycles, passenger cars and trucks. The demand has been more and more for speed and traction, for greater comfort in riding, and for saving of the vehicle and the road. In response to this demand, tire construction has changed and progressed so rapidly that equipment which four years ago averaged 4000 miles, as constructed at present, will render more than double that mileage. In spite of these marked manufacturing improvements in tire development and in quantity production, improvements that have given a standard product and at the same time reduced its cost 100 per cent. to the consumer, the motorist has not been made to realize how much additional saving he can add by giving his tires the same intelligent care that he gives to his motor or other units.

THE motorist has frequently failed to appreciate that fully 80 per cent. of the materials that go into a high grade pneumatic tire are of a vegetable nature, and consequently perishable, and that the rapidity of perishableness depends to a considerable degree on the extent of unnecessary exposure of the tire to the deteriorating combination of moisture, light and heat, as well as avoiding destructive abuses such as cuts, abrasions and rupture.

Billion a Year for Tires.

Steel tires may be practically immune from human abuse, but rubber tires are not, and their careless destruction becomes a world-wide economic loss, with an annual tire bill of considerably more than \$1,000,000,000. Authorities figure that with proper care 10 per cent. additional tire mileage could be obtained, which translated, means a yearly upkeep saving of over \$100,000,000.

Keeping in mind then that without rubber tires the motor vehicle as we know it today could not exist; that the rubber and cotton in tires are of a perishable nature and have limits in withstanding abuse; and that by observing simple precautions, easily within the ability of anyone, tire mileage can be prolonged 10 per cent.—is it not worth while to exercise caution?

Care and Upkeep of Tires.

A majority of pneumatic tire failures take the form of a puncture or blowout. Punctures are generally easily understandable, since they result from a sharp substance piercing both casing and tube. Well constructed tires of proper size for the car do not puncture easily or frequently. Because of their tough construction cord casings puncture less easily than the square woven fabric type.

Blowouts on the other hand, may be traceable to a long list of causes. A blowout may occasionally affect only the tube. More often, however, it involves both tube and casing. A blowout or rapid leak in the tire alone is more often the result of a tube pinch, caused by mounting on improper size or dirty rims, by lack of soapstone lubricant, by dirt or rough spots or rupture in the casing, by

improperly fitting valve, by folded flap or by catching the tube under the bead.

A reasonable insurance against tube pinching and the resulting leak or blowout is to exercise intelligence and select the proper size tube and flap for the casing, keeping the rim in good condition and using care in the assembling and mounting of these units.

What Makes a Blowout?

Ordinary blowouts that affect both casing and tube are the result of a weakening in the fabric of the tire carcass. All tires blow out in time if used long enough, but such natural failures come late in tire life. It is the blowout resulting from tire abuse that is costly and that must be avoided if the tire is to render its full service.

The most flagrant tire abuses, resulting in premature blowouts in casings, are: Overloading, under-inflating, over-speeding, faulty wheel alignment, driving in car tracks or ruts, neglected cuts and the improper use of anti-skid devices. A brief detailed discussion of each of these major abuses follow:

Overloading.

All tires have a load limit. Constant slight, or occasional heavy overloads shorten tire life. To determine accurately the load carried on a vehicle tire, weigh separately the front and rear wheels, and divide each weight by two for the tire load. To this can be added weight figures corresponding to the average front or rear passenger load. The maximum actual tire load should not exceed the maximum load carrying capacity advertised by responsible tire manufacturers.

Under-Inflating.

Proper inflation is as important as proper loads. Tires are not built to take the place of steel springs or essentially of shock absorbers. Under-inflating results in an unnatural flexing of the layers of fabric, which causes separation and early destruction of the tire carcass. To be sure it makes the car ride easier, but it costs money. If easier riding is desired over-size tires may be used, and such tires, in addition to furnishing extra resiliency, give more traction on rear wheels and supply greater mileage. Incidentally, it may be remarked that over-sizing tires requires a readjustment of the speedometer; otherwise the recorded distance will be less than that actually travelled.

It is not always good practise to change inflation pressures with changes in atmospheric temperature, since frequently more damage results from endeavoring to compensate for an increase in tire temperature than is caused by the increase in temperature itself.

If you collect automobile racing statistics you will find that the average life of a high grade tire on a racing car is under 500 miles—which is about 1/20 of the life of a tire operated under ordinary conditions. This difference in tire service is due in part to a difference in heat developed, and also to the tremendous "side thrust" as the speeding car sways around the sharp turns.

Overspeeding.

Heat exerts a deteriorating effect on vulcanized rubber in proportion to the intensity and length of time the rubber is exposed to it. The source of heat that does most damage is that produced at high speed by the internal friction of the tire carcass. The heat developed by frictional contact with the road when travelling rapidly also has some influence. Tires are so designed as to resist the effects of heat produced by ordinary every-day car operation, but tires cannot remain long intact when highly heated by continuous or even intermittent speeding. The results of such practise are rapid loss of elasticity and flexibility, which eventually leads to complete tire carcass break down. From the standpoint of tire life, mechanical upkeep and gasoline economy, car speeds should be kept within prescribed limits. There is almost no limit to the life of the tire if used by a careful driver who has made careful driving a hobby.

Faulty Alignment.

Among the factors which have an intimate relation to tire mileage is wheel alignment. The free rolling motion of a tire is affected by a small wheel mis-

AN EASILY BUILT SUIT CASE RACK



Handy Luggage Carrier for the Tourist.

alignment and the result is excessive tread wear. When the two opposite wheels are not parallel there is a diagonal grind at the point where the tires come in contact with the road surface which wears off the rubber almost as fast as if in contact with an emery wheel.

Front wheels may be out of alignment due to cross rod, axle or steering knuckle becoming bent by contact with the curb or some other obstruction, or the cross rod or knuckle may be improperly adjusted. Also the tire alone or the tire and rim may be improperly mounted on the wheel.

Because of the tendency of the front wheels to spread during driving, car manufacturers set the wheels at a toe-in of from three-eighths to one-half inch, and when thus adjusted the wheels are properly aligned. The measurements showing these differences should be made between the felloes of the two front wheels at points inside and on a level with the axle. Alignment of the toe-in of the wheels should not be confused with dish, which is setting the wheels further apart at the top than at the bottom. Frequent checking wheel alignment saves tire wear. It is a factor that should not be neglected.

Rough pavements and crossings tempt the motorist to drive on street car tracks. While it is admittedly true that the use of the car tracks is justified where road conditions are almost impassable, it is also true that the strain on certain parts of the tire due to continuous running on car tracks will not only quickly wear a depression in the tread rubber, all around the tire, but the sharp bending action and overload on the fabric directly under the depression eventually will produce an inside fabric break. Running on car tracks is an extremely expensive habit and should be indulged in only in extreme necessity.

A barefoot boy appreciates the need of quick attention to his surface cuts and bruises, which, given such protection, are self-healing. Tire tread cuts also are self-healing if promptly treated with

materials tending to partially vulcanize the cut. If not thus treated the elasticity of the rubber allows the cut to expand under load compression with every turn of the wheel. Dirt, glass, sand and pebbles wear and tear away the rubber until the cut has reached the first layer of tire fabric where the foreign material creeps along and piles up between the tread rubber and carcass, forming "sand blisters."

Most cuts are avoidable and the result of tire contact with sharp edges of railway tracks, worn horseshoes, broken glass, wheels spinning on wet pavements and in mud holes, and by skidding the tire by sudden brake application. There is little excuse for the majority of these cuts, the remedy for which is to examine the tires at regular intervals,

Egypt is reported as having 4337 motor vehicles.

Texas has a greater road mileage than any other state: 128,960 miles.

Mexican peasants greatly favor old tire treads as a source for footwear.

The automobile industry was third in 1920 as a producer of tax revenue.

Twenty million pneumatic casings were manufactured in 1921.

Russian women road builders receive an equivalent of 50 cents per day.

It is likely that Spain will lower the tariff on automobiles early in 1922.

Production of automobiles and trucks for December was approximately 125,000.

Forty-eight makes of cars showed price revisions at the recent New York show.

Paid attendance at the 1922 New York Automobile Show was the largest on record.

California now leads all states to the extent of having one car to every 5.19 persons.

Buenos Aires has the only factory in the Argentine producing automobile tires and tubes.

An increasing use of motor busses by street car companies is noted throughout the country.

with the object of removing all penetrating objects, such as nails and tacks, and to wash out the holes and cuts, closing them by properly prepared healing preparations. Investment in tires does not end with the original purchase. To the first payment should be added a relatively much smaller but important investment in methodical care.

Anti-Skid Devices.

The use of chains or other anti-skid devices is advisable under certain conditions. A well-designed non-skid tread, where care in driving is exercised, is generally sufficient insurance against slipping on wet pavements and hard surfaced roads, yet there are conditions of ice, mud or deep snow when chains are a necessity, and for such occasions they should be carried as regular equipment. Care should be used in putting them on, as many tires have been ruined by careless chain adjustment.

There is nothing complex about the automobile tire. It is not intricate in construction, nor design. For this reason there is positively no excuse for the present enormous size of America's tire bill. The foregoing paragraphs should give the intelligent driver sufficient data to take proper care of the tires. Let's all practise this economy and see if we can't cut a large slice off that yearly bill of waste.

ELECTRICS IN INDIA.

A type of electrically-driven motor vehicle which, on account of the increasing difficulty of maintaining a supply of petrol, has been introduced into India since the war, is equipped with a motor that normally develops eight horsepower at 900 revolutions a minute with 80 volts pressure. This motor is, however, capable of taking overloads up to 300 per cent. for short periods.

The controller operates the motor on five speeds, three forward and two reverse. The front wheels of this wagon are fitted with single tires and the rear wheels have twin tires of similar size.

May Be Passenger Carrier of the Future



Constructed as an Experiment by a Los Angeles Designer, This Eight-Wheeled Vehicle Is Said to Have Several Features That Especially Recommend It. It Is Very Speedy, Is Easy Riding and Does Not Skid on Wet Going.

(Continued from Page 13.)

hence, they detract from the comfort of passengers. And it is decidedly uncomfortable if one has to stretch far from the driver's seat to manipulate instruments on the dash. A short wheelbase and lack of scientific body design means insufficient leg room.

"Accessibility of all moving parts for adjustment or repair is necessary to mental comfort. High tire mileage and low gasoline consumption add to the comfort of all other things.

"Absence of vibration and freedom from annoying rattles contribute to mental ease. And, of course, the cushions of the car are vitally necessary to bodily comfort."

Another dealer deprecates the practise of some buyers in concentrating their attention upon the body, rather than upon the mechanical features. He says:

"People who use motor cars seem to have come by the idea that their choice of cars should almost begin and end with things like the body style, the upholstery and the various items which contribute to comfort and convenience.

"They have seemed to forget that the one really big factor which has to do with their comfort and convenience is the chassis; and that if the chassis is right they are sure to get the greatest usefulness from their cars at the lowest cost.

"In all justice it should be said that the motor car buyers are not wholly to blame for this attitude. Many may have taken it consciously; it doubtless has come upon others unconsciously. The progress and development of the automobile may be said to be responsible.

"In the early days of the motor car, when it was in a more or less experimental stage, men bought no car until they were convinced by their own investigation or otherwise, that it was about the most dependable to be had within their means.

"But that period of uncertainty, if you please, was of short duration. The motor car made long strides into a state of development which had dependability for its watchword. Which, of course, was exactly as it should be.

"Fundamental principles were found, and they are still fundamental. There was argument as to the number of cylinders, the kind of clutches, the best oiling systems, and so on. Each manufacturer, perforce, settled these matters according to his own lights. But all of them strove, and most of them succeeded, in producing designs and cars which were reliable and gave good service.

"The buying public was quick to sense this. One car appeared to be about as good as another, so far as reliability was concerned. The matter of buying a car largely became, first a question of price, and after that a question of a number of other things. Last, consideration was given to the machinery.

"In spite of the fact that motor cars are now dependable, economical in varying degree, and so on, the other fact remains that the automobile is essentially a piece of machinery. More than that, it is a piece of machinery which, speaking



Cross Section of Modern Chassis.

by the large, is expected to stand more ill-use and receive less expert care than any other expensively built machinery in the world.

"Just as the chassis—the machinery—is the foundation of the motor car, so it is the foundation of the owner's satisfaction, his comfort and his convenience. All three of them rest finally upon the service he gets from the machinery. Does that fail in a large way the other gets no satisfaction, comfort or convenience.

"It is true, of course, that the automobile has been perfected to a remarkable degree—if the word perfected can be used to describe something that probably can never be made 100 per cent, perfect. But that does not of itself presuppose that all buying caution should be cast bodily to the winds.

"Different manufacturers have different ways of doing the same thing. Working from identical designs and identical specifications, two manufacturers will not produce engines that will render identical performance.

"In buying a motor car it is still a good thing to study what is hidden away under the shiny hood and the floor boards. It is still a good thing to take into account the manufacturer's reputation. It is still a good thing to make some study of the car's history and the opinion of its owners.

"When the buyer has satisfied himself

on this score—when he is convinced that the piece of machinery he is about to buy is the best he can get for his price, or for any price, if that is merely a detail—then it is time to look to other things.

"People who buy motor cars should remember for their own good, that a dashing body style, or fine upholstery, or a superlative finish, is but small compensation for a piece of machinery which does not perform satisfactorily. The motor car investment, primarily, should be an investment in machinery.

One manufacturer would get buying of automobiles down to a systematic basis. He advises a prospective buyer to look for these features in a car:

1. Economy.
2. Power and flexibility.
3. Durability.
4. Comfort.
5. Safety.
6. Convenience.
7. Ease and care.
8. Easy riding.
9. Beauty.
10. Style.

Regarding this, he says: "Buy a car having an economical record, one that will give you a maximum amount of mileage for each gallon of gasoline. This is governed by type of motor, bearings, lubrication and weight.

"You want power in an automobile. You want to be able to go anywhere. You do not want to feel any limitations in this respect.

"Durability is something we all seek in making a purchase. It is especially important when one considers the amount involved. This item depends on the integrity of the maker, his honesty, his ideals, his standards.

"Convenience and comfort are important. Buy a car that gives you the little things that make motoring enjoyable and free from care."

A manufacturer marketing a new car evidently was expressing his opinion of what the buyer seeks when he gave this description of his product:

"One of the features of our new car, which appealed most to our customers, was the car's ease of operation, simplicity of maintenance and its room and comfort. The car is so sturdily constructed



"One-Man" Tops Are As Easily Operated by the Woman.

that long life is assured, while comfort is obtained even on the roughest roads, by the long springs and the careful distribution of weight.

"The seats are real seats and their backs reach to the shoulders. All useless weight has been eliminated, which contributes to the exceptional performance of the car and assures long tire life.

"One of the most marvelous things about the car is the motor. The power of the car on hills, its acceleration and smooth flexibility of operation also are notable.

"In its construction nothing has been sacrificed to mere appearance, its beauty coming from inherent qualities of fitness of line and contour and from work correctly done."

There are some persons who look principally for the racing qualities of a car. They want a machine that will pass anything on the road. However, there are so many traffic cops and police traps nowadays that an autoist might just as well be contented with a car that will not tempt him to smash the speed laws to smithereens.

Feminine psychology is always a study for the automobile designer. There was a time when all the automobile maker had to do in order to get a woman's indorsement on his product was to build a car that appealed to the feminine sense of beauty and comfort.

He must go further than that now. He must provide a car that can be handled with ease. And that car must be so dependable that the woman who drives it knows that it will take her where she wants to go without even a suggestion of mechanical trouble.

However, women have not lost their first interest in the beauty of an automobile. The feminine desire for a distinctively individual car is quite as potent as before.



Custom Bodies Show Superior Lines.

One of the greatest difficulties with the old-time cars was that the controls had been laid out more for a man than for a woman, with the result that when a woman tried to drive she found herself put to a great amount of discomfort and generally had to resort to some means, such as a cushion behind her back to properly manipulate the controls.

Now the pressure on the clutch pedal has been reduced to such a point that it is an easy matter for any woman to properly work the clutch. Very often the reason she clashed gears in shifting was simply because she did not have the strength to disengage the clutch all the way. In other words, driving was a feat of strength as well as of skill.

Some makers have now gone into the matter of lightness of the clutch pedal to such an extent that it can readily be thrown out of engagement by simply pressing on it with the hand.

There are other ways that cars have been made better from the standpoint of the woman who drives. One of these is the more accessible location of the necessary tools. There are women who know how to make minor adjustments, but

who shrink from the idea of attempting to lift the heavy front seat to get at them.

The divided front seat is, of course, lighter than the continuous one, and with it the position beneath the front seat seems to work out quite nicely for the tools. If the manufacturer will use foresight enough to think out what would be the most useful articles to put in the flap inside the front door he will be surprised to find how many women would be in favor of the car from that standpoint alone.

Another terror which has been removed from the woman who drives in the country is the extended use of the power-tire pump. Visions of back-breaking work over a tire pump in event of accident on the road disappeared with these tire pumps.

In the first place, there is always a spare tire at least on the rim and all pumped up and ready for use and then, in the remote chance that two punctures may occur on the same trip, it is possible with the use of the demountable, quick attachable rims now in use to rapidly put in a new tube which the engine power pump will inflate to the proper measure in a moment.

The modern top can easily be handled by a woman, and no one who rides in a modern machine need ever be afraid of mere weather, as the car has been rendered independent of it.

Position of the levers and other control features of the cars have been given greater attention from the woman's standpoint. The foot room in the driver's compartment is also better. There has been very much improvement by the better pedals that are now being used and by the practise of putting foot rests so that the foot is in an easy position, where it will not become tired, even on long drives.

"HAPPY BABY" AUTO HAMMOCK.

Autoists who have not already had an opportunity of seeing the "Happy Baby" auto hammock in operation should call on the nearest dealer and ask for a demonstration. The baby hammock is something which is said to have created more genuine enthusiasm among automobile owners and dealers than anything that has been offered for years.

The hammock is a most practical device for carrying a baby on automobile trips and should make an instant appeal to motorists. It means added comfort and less worry on trips. Suspended from a car top it does not hinder the passengers entering or leaving the back seat and is adjustable at any height.

The "Happy Baby" hammock is said to be made of the finest material throughout. All motion and vibrations of the car are eliminated through 16 coiled spring shock absorbers which fasten the hammock to the folding steel frame. When stopping at a hotel at night or camping by the wayside, the hammock may be quickly suspended from convenient supports or held by the detachable steel stand, providing a bassinet for

the baby. The stand folds into small space and the hammock folds into the car forming a comfortable seat cushion. The hammock is made in two sizes and there is a style to fit every purse.

The Baby Hammock Co., 88 Pearl street, Boston, Mass., is the manufacturer of this useful device, which may be seen in space No. 717, Department H, at the Boston Auto Show.

WAR ON MOSQUITOES.

A new implement of warfare in the fight against the blood-thirsty mosquitoes of New Jersey has been brought forward with very effective results. The salt marshes bordering the ocean have from time immemorial been the almost impregnable stronghold of the mosquito. The method of attack is to drain these marshes by means of ditches and trenches constructed with the use of heavy ditching plows, drawn by tractors. The mosquitoes are so vicious that to use horses is almost out of the question, but they cannot pierce the shells of the iron machines. It is not stated what the tractor drivers use to protect themselves from the onslaught of the enemies.

WIN IN EGYPT.

A preliminary announcement from the Egyptian ministry of agriculture shows that American tractors, almost without exception, proved to be the best in the motor tractor trials in Egypt some time ago. Three American tractors shared first place, as the judges considered them of equal merit and better than any other tractor competing. The fourth place was awarded to an American tractor which was manufactured in England, and the fifth place to another American tractor. A British tractor was awarded sixth place and the seventh place was divided between a British tractor and a tractor of Czecho-Slovak manufacture.

EXHAUST HEATS WATER.

On a southwestern Michigan farm the exhaust from the car engine is used to keep the water in the stock tanks from freezing. The exhaust is discharged into an old hot water tank and from there is conducted through a rectangular frame of pipe resting on the bottom of the trough. An elbow over the rim of the tank permits the exhaust to discharge into the air.

Fords Find Paradise

(By IDALEE WESTLY.)

HAVANA has 12,000 automobile and 8000 of them are Fords. At least their manufacturer intended them for Fords, and no one would have questioned their genealogy when they were taken aboard the Cuba bound ship. But Cuba is the home of Metamorphosis, and a few weeks of tropical environments transforms the "flivver" into the "fotingo"—and between the two is a social gulf impassable.

The car embarks from its native land snugly confident in shiny black. With the same confidence inspired of new paint and youth it lands on Cuban soil—and emerges, eventually, from the customs building. Finally delivered into the hands of the owner it marvels, likely, at the shamefaced way in which it is received, for without delay it is rushed to the nearest "repair, rebuilding, paint and accessory shop."

IF ON the way it happens to meet one of its fellows who has been in Cuba a few weeks the mystery is cleared up, for in this strange country the new black travelling dress is considered shameful dishabille.

Original Paint Removed.

Inside the shop the transformation is begun by removing the original paint. In northern lands of snow and gray days perhaps black has its place. Cuba is an island of sunshine and brilliance. The car must not sound a jarring note; so it is clad in a coat of red or green, with fenders blue lined, and wheels of some strikingly contrasting hue. Gilt monograms give a final touch of distinction.

Next in importance comes the upholstery. There are numerous choices now. Perhaps the "fotinguero" (Cuba's name for fotingo drivers), chooses red or salmon pink plush. More often he prefers imitation leather, studded with gilt tacks and fantastically brocaded. The

wheel is modestly clad in brown leather. The top, too, since it is usually lowered so as to better admit the moonbeams on balmy nights, must have a cover. Mayhap it harmonizes with the paint or the upholstery; better if it doesn't, for in Cuba where color is concerned the fotingueros say, "the more the merrier."

This finished, the ambitious driver has completed the background of his art. Next come the bumpers, front and back, and shock absorbers innumerable. One can take no chances with the masterpiece!

Three Tail Lights.

Then last, but greatest delight of Cuban creators of the fotingo, are the lights. With no laws to interfere the imagination may be given full play. The two standard headlights serve as a basis. One is provided with a red light, the other with a green; or perhaps one is yellow and the other purple. The important thing is that there be variety. A spot light is next provided of 200 locomotive

power. It is indispensable, especially upon dark nights, for night blots out even the most reckless color riot, and unless the passing driver is blinded several blocks away he may pass without becoming aware of the haughty fotingo. The radiator of all really aristocratic flivvers must be surmounted by an aeroplane, also lighted. The fenders must not be overlooked. An 18 carat cluster on each side gives a blase touch not otherwise acquired. Three tail lights of assorted colors complete the lighting effect.

Finished Job Dazzling.

The finished and completely arrayed fotingo is indescribably dazzling. Some drivers indeed become so self-satisfied in their glory that they must destroy the last chance that some discerning person will penetrate the masquerade and recognize the humble origin of the car. I have seen one that displayed across its radiator a "Cole eight," and another proclaimed itself a "Wichita."

PREMOCAR ROADSTER

THE Premocar roadster has a wheel base of 117 inches and is mounted on a seven-inch channel steel frame. It has the same standard units that the touring model has, namely, Falls motor, Timken axles, Borg & Beck clutch, Wagner starting and lighting, Connecticut ignition, Spicer universal

cushion for carrying the curtains and packages. The big feature is the unusually large rear compartment. The lid lifts up over the entire rear section, which enables the driver to place a steamer trunk inside if he so desires. There is plenty of room for suit cases, grips, bags, packages and the like. This roomy com-



Long, Roomy
Luggage
Compartment
Enhances Utility
of Premocar
Roadster.

joints, Stromberg carburetor, Muncie gearbox, Willard battery and Stewart vacuum feed system.

Several features are incorporated in the Premocar roadster that should make it prove quite popular in the light car field; it has a large, roomy seat, wide doors and a compartment behind the rear

partment means a great deal to business men and salesmen who generally find it necessary to carry quite a few things with them on their business trips.

The Premocar roadster's standard color is a maroon with cream wood wheels, although the owner has a choice of any color that he desires.

MACHINERY MODERNIZES FARMS.

"More than ever, farmers are turning to invention and science to do heavy work of the farm," says F. B. Smalley, a prominent agricultural authority of Ohio. Machinery that is being used by progressive farmers everywhere has paid for itself many times over, according to Mr. Smalley, in time and labor saved and results achieved.

"The cost of this machinery is relatively small," said Mr. Smalley. "Most of the heavy, hard farm work of the farm can be done by machines. Agriculture is one of the five basic industries of the country and should keep pace with the progress of invention. The farmer is as much a business man as the commercial and industrial leaders in the cities and in many cases is more vital to the economic life.

"Some farmers are still clinging to the horse to do their heavy work. Yet many farmers realize that the horse is notoriously inefficient for long, grinding work and that the cost of his up-keep during the winter months makes him a costly farm hand."

Mr. Smalley might have gone still further and told of the many farms that are being operated wholly by power with most satisfactory results.

Make Desert Safe for Tourists

THE largest county, San Bernardino, Cal., contains more than 20,000 square miles. All of this county, except a few hundred square miles, is arid land, forming the greater part of the Mohave desert, which is partly included in Los Angeles, Kern and Inyo counties.

MOST persons who are unacquainted with the desert believe it to be a barren waste, incapable of supporting life and without value—a barrier that separates fertile lands on either

side of it. But to those acquainted with it the desert is one of the most interesting regions of our country. Animals and plants are found there in considerable variety.

In 1917-18, under an appropriation from Congress, the United States geological survey, in cooperation with the department of engineering of California, surveyed the Mohave desert region, and recently the geological survey has issued Water Supply Paper 450 B, entitled, "Routes to Desert Watering Places in the Mohave Desert Region, California," by David G. Thompson. The region covered by this guide book extends from the Sierra Nevada eastward to Colorado river and from the 34th to the 36th par-

allel. The guide thus covers the south end of Death valley.

Valuable features of the guide are relief maps, which show the roads and watering places, and logs to the different routes. In addition, the report contains a brief sketch of the geography, geology and physiography of the region, suggestions to desert travellers, and short descriptions of many of the watering places, including statements in regard to the quality of the water from many of the springs and wells which, contrary to the usual notion, is not heavily impregnated with alkali. In fact, the water in several places was found to be as good as that used for public supplies in some cities in the less arid states, if not better.

THE spotlight, that "friend in need" of the motorist, is often abused by many who seem not to care for the rights of others on the road. Although the spotlight is not considered as regular equipment by the manufacturer, it is often added by the dealer or customer to the left side of the windshield, where it occupies a stragetical position within easy reach of the driver's hand.

The Spotlight and Its Uses.

allowing the driver of the car to read a sign several feet from the car without getting out of his seat.

The use of spotlights in this manner is not restricted to any extent by law, but there are many drivers who abuse the privilege, using them in other ways, which cause them to be detested by other drivers on the road, and throughout the eastern states this is illegal. In the western states there is at present no law against their use and drivers use them both in the city and country at will. In certain of the eastern states their use is prohibited while passing through cities and towns because of the intense light which they give which, it is thought, causes a danger to other users of the roads, including pedestrians and horse drawn vehicles.

Many Types to Choose From.

Spotlights may be purchased from any supply house in accessories and are easily attached to the windshield frame

by clamps which are sold with the light. The wires are then threaded down behind the dash, making connection to the battery wire at the ammeter. As this wire is also connected with the generator both the battery and generator will supply the light when the generator is operating. The second, or ground wire, is either grounded to the metal part of the car or, if a two-wire circuit is used in the car, the negative wire is connected at the nearest point to the ground or negative wire.

Spotlights can be obtained with either single or double contacts, the cost of the lamp depending upon the amount of extra fixtures involved in the makeup.

Should Be Used with Judgment.

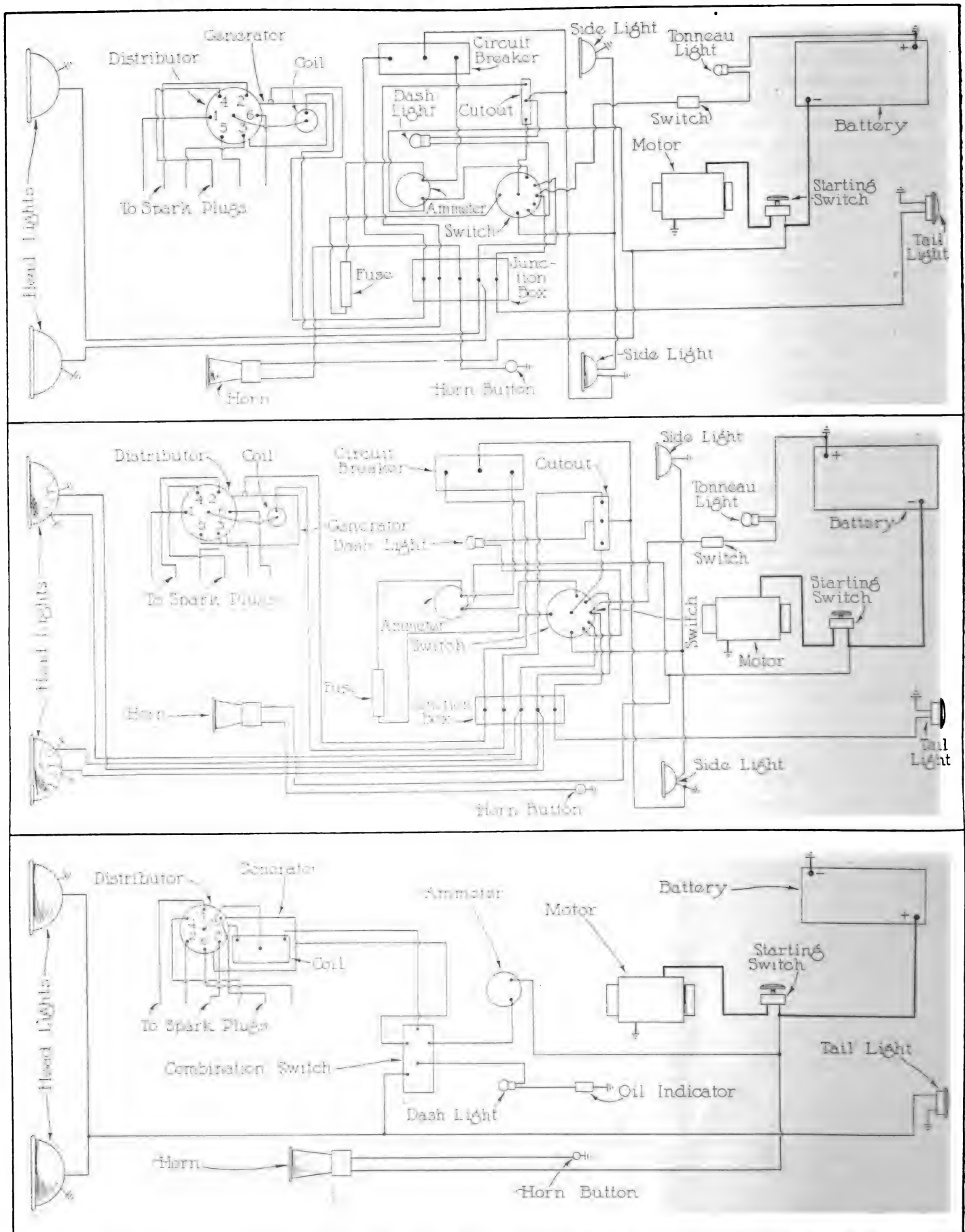
Nitrogen bulbs are usually used as they give an intense white light which is much desired, while the reflector is made in such a manner that the beam of light assumes a pencil form instead of spreading out at the sides as in the ordinary head lamp. When this light is cast on the road it causes a circle of light to form, its diameter depending on the distance in front of the car.

Type of Bus Much Used in Sightseeing



These Large Busses Are Ruggedly Constructed to Stand the Strain of Long Distance Touring. They Are Low Hung, Well Upholstered and Very Easy Riding; Veritable "Pleasure Cars" to the Person of Small Means.

Monthly Wiring Diagram, No. 25



Top—Stephens Sallent Six-Cylinder 1919-20, Single Bulb, Battery Ignition, Single Wire Two-Unit System, Separate Circuit Breaker. Center—Stephens Sallent Six-Cylinder 19-20, Double Bulb, Two-Unit System, Battery Ignition, Single Wire, Separate Circuit Breaker, Positive Connector Grounded. Bottom—Oakland Six-Cylinder, Model 34, Two-Unit System, Single Wire, Negative Connector Grounded, Circuit Breaker Incorporated in Switch.

Selecting Steel for Efficiency

JUDGING steel by its outward appearance or taking anyone's word as to chemical content is rapidly losing place with the larger passenger car, truck and tractor manufacturers. Today the manufacturer must have a knowledge of the composition of the various kinds of steel that form the vital parts of the vehicles he is manufacturing, as the purchaser of the vehicle is becoming educated to the fact that upon the type and quality of steel used depends largely the im-

portant question of whether or not he will be able to get adequate returns for the money invested. Large manufacturers of passenger cars, motor trucks and tractors in practically every instance, now maintain metallurgical departments presided over by experts in metal composition whose duty it is to test the various kinds of steel offered and from the samples offered to select that which will be best suited to any particular vehicle.

THE expert metallurgist is able to tell by means of the microscope and his test retorts just what properties are present in a sample of steel, and from his figures and deductions he is able to advise the manufacturer whether a certain grade will give the desired results.

Steel in motor vehicles must be able to withstand long periods of use without crystallizing, as crystallization will sooner or later cause breakage. Some authorities claim that steel should be allowed to rest for certain lengths of time between usage in order to prevent the molecules of steel from separating. Perhaps this is good advice, but it remains the fact that manufacturers are choosing only the best steels suited to their individual needs. The practise of government grain inspectors in grading a carload of wheat best illustrates the stand now being taken by judicious motor vehicle buyers.

The grain inspector pays no attention to the surface appearance of a car load. He makes no decisions until he has drilled his "grain tryer," a very simple device, through to the bottom of the load. In small pockets cut in the side of the "tryer," samples of the load from the top to bottom are brought out for him to analyze. If these samples show the grain to be of certain specified requirements all the way through, it is graded No. 1. But if the samples show deviations from these requirements, the load is graded No. 2 and so on. On the surface the No. 1 and No. 2 grades may appear the same. It is absolutely essential to get beneath the surface to determine the actual quality.

The same principle applies with equal force to the selection of correct steels for motor vehicle construction. Examine the gears, steering knuckles and other units of a dozen different makes of cars from the lowest to the highest price. They all may bear the same resemblance on the surface. But through the eyes of the metallurgist's micro-camera one sees, greatly magnified, that which is beneath the surface. Like the "grain tryer," the micro-camera penetrates to the inward structure and determines values.

It is, of course, impossible in common practise for the purchaser of a motor vehicle to make a scientific analysis of the quality and treatment of the metals used in its vital units.

Has Grain Similar to Hard Wood.

For the edification of the car purchaser who has a slight taste for technicalities there is recorded here some of the "inside dope" on transmission gears as presented to the layman's eye by the metallurgist's micro-camera. These gears are made from a selected steel containing chromium and nickel, alloys which tend to produce hardness, uniformity, elasticity and resistance to cracking. This steel, which is received at the factory in bar stock form, would, if treated by a special acid process, disclose a grain running lengthwise through the bar, very similar to that in a piece of hard wood.

By a special process, termed "upset forging," a gear blank is created in which the grain runs from the center to the edge, similar to the spokes of a wheel, producing a unit which, when finally completed as a gear, is approximately 40 per cent. greater in strength than the ordinary gear used in some cars and trucks. The method employed here is by no means common practise, as ordinary gears are created from stock of approximately the same diameter as the finished gear, the teeth being machined on the outer edge of the blank and the grain running with the teeth rather than at right angles to them.

It can be readily seen that should a given strain be applied to an ordinary gear the tendency would be for the teeth to break off more readily than in gears where the stresses applied to the teeth are exerted against the grain.

In addition to this very valuable accomplishment, the forging process causes the metal to become denser, tending to eliminate its porous nature and producing a part in which there is likely to be fewer imperfections, while also creating a slight breaking up of the crystals.

Must Relieve Distortion.

Besides these several advantageous results a number of undesirable characteristics are produced in the gear blank during forging. Due to the fact that the part is hammered while in a heated condition, internal stresses are set up on account of the ease with which the molecular content may be moved about, and as the unit cools very rapidly there exists a certain amount of internal distortion which must be relieved, otherwise it will manifest itself in time or from vibration in service on the vehicle.

On close examination it is found also

that the metal crystals have been "grouped" or "bunched" and that there is actually a greater number of crystals in some sections per cubic inch than in others, resulting in an inequality in strength.

Hard and soft spot variations are also noticeable, which would seriously affect machining, causing either an imperfectly finished part or creating difficulty in maintaining cutters in the machine on which the part was finished. This condition would result in high manufacturing costs and necessarily a more expensive part. Fortunately, these undesirable characteristics may be eliminated by further treatment and processes.

The next step in the construction of gears is annealing the part, which consists of heating the blank in an oven to a moderate high temperature, permitting it again to tackle on somewhat of a mobile state and tending to relieve internal stresses. Annealing prevents the possible warping, twisting or distorting of the part later in service. It also removes the hard and soft spots, producing a uniformity of texture and creating a refinement of the crystal content due to the effect of the heat on the metal.

Final Refinement.

The only undesirable element left at this stage of development is the excessive size of the metal crystals, which condition is later taken care of by heat treatment. The part is now ready for machining. It is stated Packard transmission gears are actually finished machined before heat treatment. This is made possible by the expert skill and ability of the heat-treating division to control distortion during this process to within .0002 of an inch, a dimension that can hardly be maintained even in good machining practise.

Ordinarily gears must be ground after heat treatment so that they may operate with the minimum of friction and noise. This creates additional manufacturing costs:

The Safety Factor.

After machining the gear is subjected to heat treatment, the part being placed in an oven and heated to a fairly high temperature, causing perfect distribution of the crystal content. This particular treatment is carried on beyond the ordinary transformation point of the steel without regard to the crystal size. Afterwards the steel is removed and quenched in an oil bath. Following the quench, it

(Continued on Page 42.)

Interstate Motor Theft Commission

MOTORDOM is interested in the announcement that the Interstate Motor Theft Commission is to be maintained as a permanent organization with national headquarters in Chicago. The commission was formed in 1921 to carry on a nation-wide investigation of commercialized motor car theft and fraud and to formulate plans for the destruction of the market for stolen cars and thereby provide relief from the growing menace of this profitable form of lawlessness. The commission, chartered under the laws of Illinois, is governed by a board of seven commissioners as-

sisted by national advisory boards composed of leading police and business executives. Among the personnel of these boards, which total about 100, are to be found such men as Joseph A. Faurot, deputy police commissioner, New York; Dan Beard, National Boy Scout commissioner; J. A. Hall, educational director, Associated Advertising Clubs of World; Gutzon Borglum, sculptor and president of the International Sporting club; E. M. Allen, member of the insurance committee of the United States Chamber of Commerce, and others of equal prominence.

THE persistent efforts of this body, aided by experts in crime prevention and other authorities, have resulted in the perfection of a national clearance system that will bring a powerful and destructive influence to bear on the structure and sub-divisions of commercialized motor car theft and fraud, and provide means for standardizing methods of transfer of ownership of motor vehicles.

A national clearance test to be applied to all cars registered in the United States has been carefully worked out that will result not only in the detection and recovery of a great majority of the unrecovered cars stolen in the past, but that are still in operation, but will prevent to a very large degree the future sale, use or registration of stolen cars in any state regardless of changes in numbers and appearance.

The plans of the commission are considered the most constructive and business like that have been advanced since the advent of the automobile itself, to adequately protect America's \$5,550,000,000 of motor car wealth against commercialized theft and fraud.

Since its inception, this body has enjoyed almost unqualified moral support and cooperation from many sources, among them police, detective, state, insurance and business authorities, civic organizations, motor car associations, clubs, manufacturers, distributors, dealers and owners.

The commission occupies the unique position of being the first national "workshop" built to deal with every phase and angle of the theft problem and provide a point of contact for, and cooperate with, all parties concerned in its solution.

That motor car owners may derive greater benefit from the commission's work, arrangements have been made to permit them to become members. It is thought that this will help to bring about unity in action that will go a long way toward freeing the motor car world from the burden of this lawlessness.

Profitable Lawlessness.

Motor car theft losses in the United States every 24 hours are placed by authorities at more than \$300,000—a startling average of \$100,000,000 yearly—a sum equal, if not greater than, the aggregate loss by theft of all other kinds of property.

This evil, which retards the progressive advance of almost every phase and branch of the motor car industry, imposes a burdensome liability upon owners, and a great deal of work and expense upon police and state departments, is today one of the most profitable forms of lawlessness.

State and city registrations and cards of identification have brought little relief, due chiefly to the lack of a national clearance system, which leaves it a comparatively easy matter to alter the number and appearance of stolen cars and re-register them without detection.

Contributing Factors.

Among many factors that largely contribute in making the theft and sale of motor vehicles a very profitable enterprise, are:

Garages where cars can be safely stored and sold.

Second-hand car dealers who condone lax methods or who are dishonest and act as fences for stolen cars.

Crooked politicians, crooked insurance adjusters and agents.

The accessibility of interstate travel due to good roads.

The increasing number of cars each year.

Lax and unstandardized methods of transfer of ownership of motor vehicles.

The ease with which numbers and appearance of cars could be altered, due to the lack of any national clearance system.

Lax and unstandardized methods of transfer of ownership of motor vehicles are, without doubt, the main basic factors largely supporting all others in providing a market for stolen cars.

Bills of sale can be easily faked or forged and even though received from a friend or reputable dealer, they do not prove that the car was not stolen some time in its past or sold while under mortgage, perhaps unknown to the last vendor.

Market Must Be Destroyed.

It seems apparent that no real measure of relief can be expected—present laws, locks and other protective devices notwithstanding—as long as there is a ready market for stolen cars. Therefore, it becomes highly important that all efforts be centered on the destruction of this market.

The investigation conducted by the Interstate Motor Theft Commission disclosed that the most, if not the only logical way to effectively destroy the market for stolen cars, is to standardize transfer of ownership through a national clearance system.

Therefore, among the main functions of the commission will be the operation of a national clearance system (perfected with the aid of experts in crime prevention and other authorities), providing for records of motor car registrations, stolen cars, sales transactions, mortgage and lien records and other important data, which will, among other things—

1. Make it possible to prevent to a large degree, the registration, sale or use of a stolen or mortgaged car without detection, anywhere in the United States, by providing accurate means for quickly detecting changes, alterations in the numerical or physical identification of a car, forged or faked bills of sale or mortgage releases and other elements of fraud.

2. Provide accurate means for locating a great majority of the unrecovered cars stolen in the past few years, that are still in operation in the United States, as well as any car that may be stolen in the future.

This standardization work, to be carried on by the commission, will not entail any radical changes, red tape, complication or other demoralizing disruption of established procedure or routine.

Coincident with other work, the commission will give any assistance possible to America's 10,000,000 motor car owners and all others concerned in, or allied with, the motor car industry.

Earl Makes Important Changes

George C. Morgan, Recently Placed in Charge of Sales with D. Minard Shaw and R. N. Cowham as Assistants, Plans Extensive Campaign

IMPORTANT changes in its selling division are announced by Earl Motors, Inc., of Jackson, Mich. George C. Morgan, assistant general sales manager, has been appointed general sales manager. D. Minard Shaw has also won a promotion and in addition to his duties as advertising manager, will assume those of assistant general sales manager.

Mr. Morgan's experience in selling automobiles has

been of the broadest character; both wholesale and retail. Prior to his entrance into the field in 1910 as road man for the old Thomas B. Jeffrey Co. of Kenosha, manufacturer of farm implements, he served two years as plant manager after the purchase of the business by Sears, Roebuck & Co. He was manager of truck sales for Jeffrey when he resigned to join Willys-Overland as office manager.

HIS heart was in selling, however, and returned to the sales side as manager of the Overland branch at Toledo, going later to the Citizens Motor

Willys-Overland. This post he resigned Dec. 1, 1921, to become assistant general sales manager of Earl Motors.

Mr. Shaw's equipment for his dual task as assistant general sales manager and advertising manager of Earl Motors is equally comprehensive. He began in 1897 in the classified advertising department of the Pittsburgh Dispatch, was publisher of the weekly Pittsburgh Index in 1899 and spent the better part of two years in Europe as a special correspondent. Returning in 1901 he served two years as advertising manager of the Pittsburgh Dispatch, and from 1903 to 1908 was president of the Shaw-Cassidy Advertising Agency, president of the Solar Engraving Co. and secretary of the Converse Printing Co.

From 1908 to 1913 he was vice president and sales manager of MacManus-Kelly and later of the MacManus Co., Detroit and Toledo. In 1913 he joined Taylor-Critchfield as manager of the automobile department, and was later Detroit manager for the John Lee Mahin Advertising Agency.

In the fall of 1917 he switched to the selling end of the automobile business as manager of the Herff Motor Corporation, southern distributor of Briscoe and Fiat cars at Memphis and Nashville. Early last year he became division manager for Briscoe and later advertising manager for Briscoe and Earl Motors.

R. N. Cowham continues as assistant

general sales manager with increased responsibility. Mr. Cowham is an old Briscoe man and has occupied the position of assistant general sales manager since the



G. C. Morgan, General Sales Manager, Earl Motors, Incorporated.

Car Co. of Cincinnati, distributor for Packard and Willys-Overland in Ohio, Kentucky and southern Indiana, as district manager for the Packard and



D. Minard Shaw, Assistant General Sales Manager, Earl Motors, Incorporated.

organization of Earls Motors, Incorporated. Mr. Cowham's years of sales experience makes him a very able assistant to Mr. Morgan.

THE STORY OF "WAYSIDE" BATTERY SOLUTION.

A prominent chemist of Detroit a few years ago was making the overland trip to Palm Beach. Accompanied by three of his chums on the pleasure jaunt, they were having a delightful time, had little or no trouble until away down in Georgia, when the pleasure for the time being was rudely interrupted. After hard work nursing the car along they pulled into a little village about 40 miles from Atlanta, to the only shop in the town, and after examination by the mechanic there found that their generator was in bad shape and must be repaired. As the battery was drained, it would have to be recharged,

which entailed a wait of two or three days.

The incident gave one of the party food for thought and he wondered if it would not be possible to make a solution to put into a battery that would remove from the plate in an hour or two the sulphation that requires a charging current several days to partially drive off.

For a number of years this man experimented, giving what odd time he could to his thought. Finally during the summer of 1918 he hit upon the formula of a solution, it is claimed, that will allow one to charge a battery in 30 minutes. Working on the theory that the plates should be attacked from the outside, his solution was so made as to penetrate the sulphation and return the porosity to the

plate. For the last two years the solution has been used extensively in the West. In large cities many of the department stores, taxi cab companies and other concerns using hundreds of delivery cars and trucks have a supply on hand, it is claimed, and have the batteries charged while the driver is taking his lunch hour. This solution is called a positive solvent for sulphation and is said to increase the life of a wet storage battery materially.

1921 auto registration shows an increase of nearly 15 per cent. over 1920, exceeding all estimates.

All patrolmen who are promoted to police sergeants in Baltimore, Md., must be operators of motor vehicles.

Substitution of Motor Busses

(By F. VAN Z. LANE, C. E.,* Transportation Engineer, 17 East 42nd Street, New York City.)

THE capacity of many New York (Manhattan) streets has already been reached. Yet, every day, more and more vehicles are presented for accommodation. This increasing congestion is making it more and more costly to transport both passengers and freight because of the decreasing speed with which both passenger and freight vehicles can operate. Street accidents are increasing. All this despite the fact that

this street traffic is more efficiently controlled and regulated than any other city in the world. The roadway area is limited. As much as possible has already been taken from the sidewalks and added to the highways. The entire street width between building lines cannot be increased, or new streets cut through without entailing a prohibitive expense, except perhaps in some isolated cases.

THE roadway capacity, however, can be very materially increased and the streets made safer by the substitution of motor buses for street cars. The large, lumbering street car confined to a fixed position in the center of the roadway presents an unsafe obstruction (whether it is moving or standing still) to modern vehicular traffic. Everybody recognizes this fact, but has accepted this condition, because they have not realized that there is a remedy. But there is a remedy in the motor bus.

The motor bus is no longer a theory. It is a demonstrated fact. It has proved to be an efficient means of city transportation right here in our own city. We don't have to cite London, Paris, Berlin, Copenhagen, etc., where it is a most important means of surface passenger transportation.

The successful operation of the Fifth Avenue Coach Co., the operator of the buses in Fifth Avenue, Riverside Drive and other streets, is sufficient demonstration.

For the year ending June 30th, 1920, this company operated 271 buses, which carried 42,552,709 passengers, or 157,021 passengers per bus. During the same time the Manhattan surface car lines carried 348,960,461 passengers

in 1254 cars, or 278,278 passengers per car. The number of passengers per bus is smaller than the number of passengers per car, because the buses operate over routes of lighter density than the street cars. Their routes all lead to practically one place (lower Fifth avenue), a smaller protected seating capacity (lower deck), no standing permitted, and because of the route layout and a 10 cent fare, the individual rider averages a longer ride. Yet with this loading per bus, it would have required 2222 buses to have handled the surface car traffic, compared with 1254 cars which did handle it.

Now, in so far as an increase in the number of units possibly required to handle this traffic, anyone will agree that so far as space, operating flexibility, hinderance to traffic, etc., is concerned, it would take several buses to equal one street car.

Bus Speed Relieves Traffic.

However, because of the increased speed with which buses can operate under equivalent city traffic conditions and because in this case they would cut down congestion and so be sure of operating faster, it is quite possible that it would require no more buses than street cars.

And this is not the whole story from this standpoint. A bus is more desirable in narrow congested streets because it is more flexible. It can move in and out of traffic, one bus can pass another, they can be turned at any point; run off the established route, if necessary; held in a side street for a special load, and load and unload next to the curb, out of the way, making it unnecessary for their passengers to ex-

pose themselves to the dangers of other street traffic, or hold it up while such loading and unloading is going on. Dangerous loading and unloading zones designated by obstructions in the middle of the street are unnecessary.

Not only would street capacity in the straight away be increased, but congestion and danger at the most congested points would be materially cut down.

Everyone knows of the terrific congestion at 42nd street and Madison avenue, for instance. Here the Madison avenue cars turn into 42nd street for a short block and thence turn again into Fourth avenue. This in the face of the 42nd street crosstown cars and the great vehicular and pedestrian traffic occasioned by the Grand Central terminal and the hotels and new office buildings surrounding it. With bus operation they could continue straight across and turn into Fourth avenue at any street south of 42nd street.

And similarly the congestion occasioned by diagonal Broadway at Union square, Times square, Columbus circle, 66th street, 72nd street, as well as other points about the city, buses because of their flexibility and ability to move with the other vehicular traffic could be routed so as to avoid being obstructions to other traffic.

Street Car Stops Traffic.

The elevated railroad street, Second, Third, Sixth and Ninth avenues would be wonderful vehicular streets with the surface cars removed and the buses substituted, even with the elevated columns. Without these they would be safer. But, even so, the space now occupied by cars, between the columns, would be open to fast moving through vehicles, the space



Buses with Standard Chassis and Stunkard Brothers Bodies Operated Out of Indianapolis, Ind.

at the side to buses. The possibility of this can be realized by simply watching the traffic on these streets. It goes along in great shape until interrupted by one lone street car.

With bus operation, Central Park West could then be made a two way—north and south—street, and so the full use of this roadway would be made use of. It is a one way street now (south bound) all the way from 110th street to 59th street, not because of congestion, but because the north and south bound car tracks are on one side, and if permitted on the street, north bound vehicles would proceed in the face of south bound cars. Simply a safety precaution which would be obviated by bus operation.

Lafayette street and Broadway below 42nd street) have approximately the same width roadways. Broadway is encumbered with street cars. Lafayette street is not, yet Lafayette street carries several times the vehicular traffic Broadway does, simply because it can move faster. Verify this statement by driving an automobile on both streets; this will also prove that Lafayette street is the safer.

That buses are quite as reliable as street cars is borne out by the fact that during the year ending June 20th, 1920, each bus averaged 31,707 miles, whereas each street car averaged but 26,223 miles. Some of this increase is no doubt due to the increased speed with which a bus can operate. But if further proof is necessary, during this year there were practically no bus field failures. And in this connection it must be remembered that if a bus does break down, it is the only thing that is held up. If a car breaks down, practically the whole street is tied up, and the cars following it absolutely. Some of the New York bus routes are quite as long as the longest street car routes, and yet they stand up under this grilling. All of us can remember that in the great snowstorm of February, 1920, how the buses were moving when the cars were stalled.

Would Decrease Taxicabs.

Because of their flexibility and speed, buses would not only present less of an obstruction, but they would also tend to decrease a certain type of vehicular traffic, or at least hold it where it is; that is, the taxicabs. And who cannot say that, from a street traffic standpoint at least, this would be a blessing? A bus performs a more individual service

than a car. It comes up to the curb for you and lets you off at the curb. It will get you from point to point faster. And if this mode of transportation was generally adopted many more routes could be easily and conveniently laid out. All that is necessary is good pavements, and these are found on practically every street in Manhattan.

Bus Costs Less to Operate.

It costs less to operate buses than surface cars in Manhattan. The operating expenses per bus mile for the year ending June 30th, 1920, was 35.54 cents, and the operating expenses per car miles for the same period was 53.59 cents, or, in other words, it cost 50 per cent. more to operate cars than buses. But because of the fact that buses carried fewer passengers per bus for the reasons already stated, it is not claimed with absolute certainty that buses could be operated for a five cent fare and made to pay. The fifth avenue bus fare is 10 cents and at this rate this company showed a net income for the year of \$783,127.95, whereas the surface cars showed a net income of \$4,378,677.48; or the buses a net income of 1.8 cents per passenger and the cars a net income of but 1.2 cents per passenger. Of the total net income of all Manhattan car lines, 83 per cent. was produced by the New York Railways, which company has the greatest number of short haul lines.

Could Operate With Five Cent Fare.

It is, of course, recognized that on the basis of the figures for 1920 the buses would not have paid expenses at the rate of a five cent fare. Yet there is plenty of room for belief that in view of the fact that it costs less to operate a bus, that if buses were operated over short haul routes of high passenger density, and if buses were designed perhaps with a larger seating capacity, they could be made to pay at a five cent fare, particularly with a combination of single deck, one man operation and double deck, two man operation, and with a large installation electricity may prove to be even more economical and better adapted than gasoline for power in this kind of service. Certainly with a city-wide operation more people would ride at a five cent fare than at a 10 cent fare, yet because of the long bus hauls of the Fifth Avenue Co. and because they operate over a comparatively lean passenger producing territory, feeding into but one limited business section of the city, it is doubtful if it could have met expenses

at a five cent fare. It must be remembered, one important line of this company operates on Fifth avenue where on one side from 59th street to 110th street, Central park is on one side and the wealthiest homes on the other, certainly not a very populous district. The other main route operates along Riverside drive, from 72nd street to 135th street, with Riverside drive park on one side and very high class homes and apartments on the other, so this is not a very populous district. Most of the bus riding is from lower Fifth avenue to points above 110th street on the one route and to the north of 135th street on the other route. Certainly long hauls for city street traffic.

Buses Twice as Safe.

That bus operation is safer than street car operation in Manhattan is conclusively indicated by the fact that in 1920 the Bus Company paid out but 27-10 per cent. of its total operating revenue for injuries and damages, whereas the street car companies paid out 6 per cent. of their total operating revenue for these items. In other words, the buses are more than twice as safe as the street cars, despite the fact that the entrance to the bus is open and presents a temptation for anyone to swing on to the bus while it is in operation, and also despite the fact that many passengers have to ascend and descend the curving narrow stairway to the upper deck of the bus while it is in motion. This situation is also reflected in the cost of operations—that is to say, the cost of the item of injuries and damages under operating cost are less for buses than for street cars, and so, of course, it is reflected in the total costs of operating.

Bus Here to Stay.

The basic figures quoted herein are taken from public service commission reports for 1920. The 1921 figures were not fully available, yet the indications are that they would be even more favorable to the bus. The bus has come to stay. There is no use fighting it. It is the economically sound method of supplementing subway and elevated railroad traffic in the transportation of large numbers of passengers in a large city. The stage coach had to give in to the horse car, the horse car to the cable car, the latter to the trolley car, and now the trolley must give in to the motor bus. The fact remains that buses in New York have proven themselves a success over a period of years in New York.

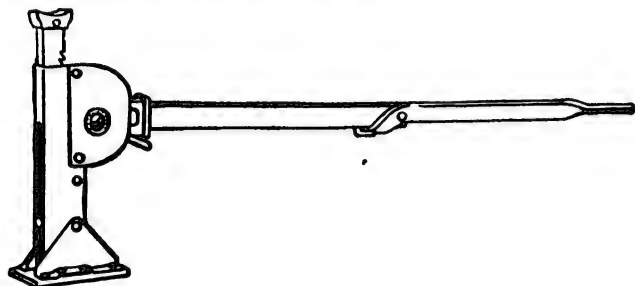


International Motor Trucks with Large Capacity Passenger Carrying Bodies Prove Successful.

ACCESSORIES DEPARTMENT

Lane H. C. Jack is placed and operated from the handle, it is stated. Placing certain jacks in position under the rear axle usually involves considerable exertion, motorists being as a rule loath to undertake the job however necessary it may happen to be.

Lane Brothers Co. is the originator and manufacturer of the handle-control jack, which is said to be placed, operated, reversed and withdrawn, all from the extreme outer end of a three-foot handle, the leverage of which makes it an easy matter to lift the heaviest car. All contact with grease and dirt being avoided by the use of this jack. When not in use the handle folds to half the length so that



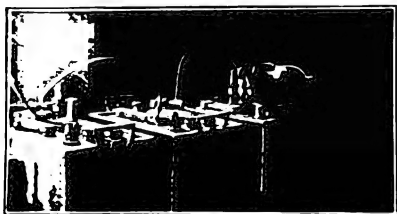
the jack may be conveniently carried in the tool chest.

There is no key on the jack, but direction is controlled by the distance the handle is entered into the socket. If all the way, it raises, while lowering is accomplished by pulling it back a half inch or so.

To change the direction of jacking either up or down one pulls the handle a trifle in or out of the jack, an innovation which should appeal to all motorists. These jacks can be purchased through automobile supply houses or direct from the firm.

Manufactured by Lane Brothers Co., Poughkeepsie, N. Y.

The Rose Everlasting Battery Clip is made of a special compounded metal which resists corrosion by the action of the acid. The heavily insulated cable is cast into the body of the clip. The clip is so designed that it is universal in use, fitting practically all types of batteries on the market. By pinching one end of



the connector between the thumb and fingers the clip telescopes the post and when the pressure is released makes a firm connection. By compressing the small or

pointed end it can be slipped into the female type of post and the tension released. It also fits cables and flat bars, giving a perfect connection under all conditions.

Manufactured by the Frank Rose Manufacturing Co., Hastings, Neb. Price on application.

The "Wedford" Allen Valve Insert has been on the market for more than a year and is claimed to provide a more thoroughly leak proof, more efficient tire



valve, than has heretofore been obtainable.

This valve inside was designed with the idea of producing a mechanically perfect and serviceable part, and is claimed by the manufacturer to present an adequate change and a great improvement in this important tire accessory.

It is interchangeable with older types of valve cores and functions properly with any air connection, it is claimed. The manufacturer wishes to emphasize the following points and exclusive features: The spring is entirely enclosed, the complete inside is rigid, sturdy and compact, making it very easy to insert in a stem when the tire is carrying pressure, and a special composition valve seat and compression ring gives an unusually long life under the abuses of service, rigid inspection assuring one of practically 100 per cent. serviceable valve cores.

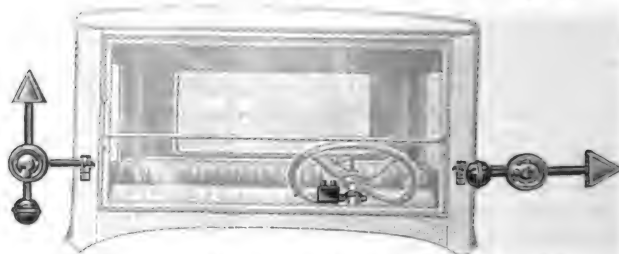
Manufactured by the Allen Valve Manufacturing Co. of Los Angeles, Cal.

Hankee Signals are claimed to be the only all-electric safety traffic signal for automobiles and trucks possessing all of the following features:

They are visible for a great distance from the front, as well as from the rear; they are visible day and night; operate in clear view of the driver; located where other drivers are looking for a hand signal; away from mud and dirt; dust or snow does not render them less visible; operated by a patented electro-motor in the central housing of the signal by the instantaneous push of a button conveniently mounted on the steering column; in-

stalled like a spot light; all wiring under dash board.

There are, in the Hankee, no mechanical gears or levers or disfiguring box or lantern-like contraptions to mar its attractive appearance; no current is used by the motor while the signals are either at rest or in the signalling position; no drain on the battery; the current used is about 12 amperes for the second only that the button is pushed; no wearing parts; nothing to adjust; no rattle; the two-candlepower lamp in the arrow head is easily accessible for renewal; the left signal makes an economical parking light.



Manufactured by the Naser Electric Co., Minneapolis, Minn. Prices, \$24 for the double set (left and right) and \$12.50 for the single set (left signal only).

The Wotton Battery Charging Rheostat is designed to charge Starting and Lighting batteries on any direct current voltage from 32 to 110, taking care of a maximum of fourteen batteries at one time on 110 volts. It can be used either



to provide charging circuits from standard direct current generators or on the regular power lines.

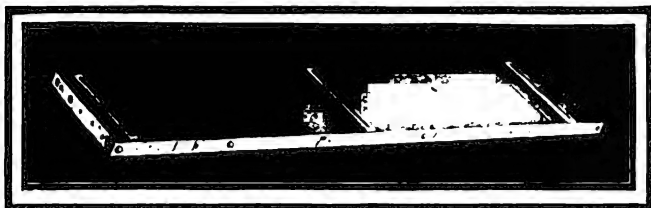
Manufactured by The Electric Products Company, 1725 Clarkstone Road, Cleveland, Ohio. Price, \$24.00.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

The Smith One-Piece Pressed Steel Running Board is made in two types: One has the conventional linoleum covering, while the other, that shown in the cut, is topped



with a single sheet of aluminum. It may be readily seen that a pressed steel running board, not being subject to swelling, warping and rotting, retains its original appearance after years of service. There



is no loosening of bolts possible, the pressed steel construction actually adding to the strength of the frame and giving better support to both front and rear fenders. The replacement is as easily ac-

complished as the replacement of a tire.

Service men know that in repairing or replacing wooden boards the carriage bolts do not hold, making it necessary to

tear up the linoleum covering. The new all-steel boards eliminate all these troubles, providing standard made-up boards for all makes of cars so that with a small stock replacements can be taken care of immediately.

The second illustration shows the under side wide arrangements for accommodating the brackets. The permanently good appearance insured by these new boards will be recognized by motorists as an important factor in keeping up the resale value of their cars.

They withstand collisions better and if damaged can be put in shape by using a lead hammer.

Manufactured by the A. O. Smith Corporation, Milwaukee, Wis.

The Meile Automatic Safety Traffic Signal is the result of a long period of experimentation by the manufacturers of this device, who feel that they have designed a signal that meets the requirements of the motoring public. Very little current is drawn from the battery, as the signal operates only at certain speeds of the car. When the speeding autoist desires to stop he shuts off the gas—when the speedometer registers 15 miles an hour the Meile signal flashes "slow." This shows until the car slows down to five miles an hour, then the signal automatically flashes "stop." This warns the driver behind without any trouble on the



part of the driver. If it is intended to turn one simply pushes a button on the steering wheel, which instantly flashes the intention to the driver who may be following.

The Meile signal works both day or night, as it is positive in action and automatic in its method of operation. Provision is also made in designing the signal for positive illumination of the register number of the car and for a red light for night driving.

Made in one model to fit all makes of cars. Finished in black japan regular or satin nickel finish at extra cost.

Manufactured by the Meile Manufacturing Co., 21st and Illinois Avenue, East St. Louis. Price, \$35.

The Disteel Right-Angle Valve Stem Extension is especially designed by Schrader for use with Disteel wheels and offers an important advantage in inflating tires from the outside. This advantage is greatly appreciated by those who look

after their own cars, and especially where on occasion a woman driver must inflate tires.

The valve extension is supplied as op-



tional equipment on Disteel wheels, and those having Disteel-equipped cars may obtain it at a nominal cost.

Sold by the Disteel Wheel Corp., Detroit, Mich., or any of their factory branches or service stations. Prices on request.

Union Tool Chests are ruggedly designed to meet the exacting conditions of service station repairers, carpenters and others who find the necessity of using many expensive tools and wish to keep them under lock and key. The tool chests are made with a tray that automatically raises with the top and always remains level and out of the way; or the chest may be finished without trays if desired to accommodate larger tools, such as blow torches, etc., and for repairers who prefer to make special trays to fit their needs.

It is stated that only the best lumber obtainable is used throughout in the construction of these chests, while the zinc covering is the best quality lacquered



zinc that is guaranteed not to rust or corrode. All corners, catches, clamps and locks are brass plated and lacquered steel, securely riveted on and furnished with special 12-change Corbin Lock.

The style shown is 7 1-4 by eight inches inside and is made in seven different lengths from 13 inches to 32 inches.

Manufactured by the Union Tool Chest Co., Inc., Rochester, N. Y. Prices and literature on request.

The Robertson Tire Inspecting Machine has been designed especially for the tire adjuster and repair man as its use quickly shows damage not visible by ordinary methods of examination. For inserting liners, patches and large reinforcements it is claimed to be indispensable, as the beads can be easily sprung apart and the patch inserted in a few minutes time. In locating rim cuts, broken beads, loose tread spots and similar troubles the machine proves of great value. In inserting tubes into new cord tires the beads, it is stated, are easily sprung apart and the tube inserted without difficulty.

To operate the machine the tire is hung over the two top rolls, with the weight resting on the bottom guide rolls. Throw in the two pulling fingers, press down on the foot lever and the beads will be



spread open, pushing the bottom of the tire upward, showing the trouble. Release the foot pressure, turn the tire, chalk-marking the injury for the repairer or adjuster.

Repairers, it is claimed, can easily and quickly locate bruises, stone cuts, broken beads, rim cuts, loose treads, etc.

Manufactured by the Rockford Tire & Vulcanizing Co., Rockford, Ill. Price and literature on request.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

The G-G-H "Popular" Windshield Visor is of extremely simple construction and can be installed in five minutes' time. It cannot sag to obstruct the view while driving and will, it is stated, positively hold its position when adjusted. It is universal in its adaptation to fit any open or closed car. The patented thumb screw adjustment allows its placement at any angle instantly without trouble, delay or tools, as may be noted from the illustration. Its exclusive design eliminates unsightly side brackets and windshield



clamps. It has a strong, electrically welded steel frame, double braced, covered with du Pont Fabricoid water-proof top material. The exposed metal parts are heavily japanned. It is shipped complete with clamps and screws ready for attaching and is packed in a neat carton.

Manufactured by the Grigsby-Grunow-Hinds Co., 900-906 West Lake Street, Chicago, Ill. Price, black fabric, both sides, Catalogue No. 2115, \$6; No. 2116, black outside, green inside, \$6.50.

The Auto Indicator consists of a rear day or night safety signal for the driver following, which gives a clear indication of the intention of the driver ahead. Its operation is purely mechanical, depending on the pull of the brake rods for the operation of the Stop signal and on the movement of a short lever on the steering

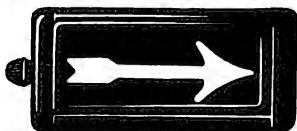


wheel post operated by the driver to indicate right or left turns. A caution signal is indicated by arrow heads, while for night driving a red light is shown.

In attaching the signal, which it is claimed can be done in 30 minutes time, the rear lamp is removed, together with



the number plate and the signal attached to the lamp bracket with the number attached below. Electricity from the storage battery is used only for the lamp,



which is enclosed in the signal, all other movements of the signal being mechanical.

Manufactured by the Auto Indicator Co., Grand Rapids, Mich. Price, \$20.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

Millersburg Expansion Reamer—Millersburg Expansion Reamer, said to be a new tool, is not an ordinary spiral tool, but a helical tool with flute helix angle of 180 degrees. The shearing action of the helical flute eliminates all chatter and increases cutting efficiency 30 to 40 per cent., states the manufacturer.



This new tool is claimed to produce smooth, clean-cut and accurate reaming work, and due to the free cutting qualities insures far greater strength and durability. This tool, though on the market a short time, is said to be in use by a number of the largest automobile manufacturers in the United States.

Manufactured by the Millersburg Reamer & Tool Co., Millersburg, Pa.

Wedford Featherweight Clothing is claimed to be "the last word" in lightweight equipment for automobile drivers. Men's rain coats in this line are stated to weigh scarcely 24 ounces. It includes this type of raiment for ladies, children and boys as well as for men. The garments are all made of balloon cloth and have that soft silky finish that is so much admired. This cloth is not rubber treated, still it will not stick, leak or crack, according to Harry G. Wedler of the manufac-



turing company. These coats are made stylish enough to please anyone and are strong enough to stand the hardest wear. They may, moreover, be rolled in a very small package and are thus as convenient to carry as an umbrella.

The Wedford featherweight rain coats come in three colors for men and boys, olive-drab, dark brown and black. The

colors for ladies and children are olive-drab, dark brown and blue.

Manufactured by the Wedler-Shuford Co., 320 North 19th Street, St. Louis, Mo.

The Saf-T-Visor consists of a carefully finished piece of thoroughly seasoned wood with metal fittings. The visor is heavily enameled in black on the exposed upper side and in dark eye-resting green on the under side. It is especially light weight and of great tensile strength, assuring lasting service and obviating any chance of loosening windshield glass or pulling windshield frame out of place on account of excessive weight and constant "road jar."

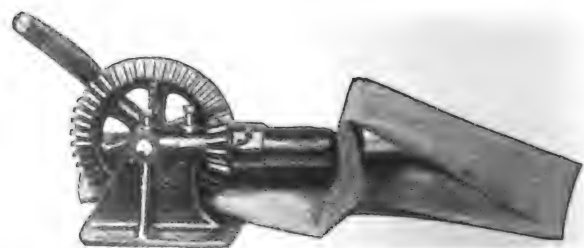


It is claimed that Saf-T-Visor is rattle-proof; instantly adjustable to any desired angle from the seat; has no sight obstructing side brackets or braces; that rain drip is led to the sides by special construction; that it is easily and quickly attached or removed by anyone and that installation will not damage the finest car; that it does not interfere with windshield or auto top adjustments in any way. All fittings are enameled with the highest quality enamels.

The manufacturers claim to have produced a windshield visor that possesses every feature the perfect windshield visor should have. It is an accessory of unusual "Safety First" importance and will add neatness, smartness and beauty even to the highest priced cars.

Distributed by the Saf-T-Visor Sales Co., 230 Main Street, East Toledo, O. Price \$5.

The Hiller Valve Wrench Machine is designed for the tire shop or factory, where it is often desired to remove and replace tire valve nuts rapidly. A suitable size wrench is fitted at the end of the revolving spindle, which fits over the valve stem around the nut, the valve stem being held rigid in the interior of the wrench. Turning the handle revolves the wrench and nut on the stationary stem, making the



removal or replacement a quick and easy job.

Statement is made that rusted nuts are as easily and quickly removed as those that are not rusted and that battered threads do not hinder the operation of the wrench.

The manufacturer states that all machines are guaranteed and all worn or broken parts will be replaced free of charge if the breaks are due to imperfect workmanship or material.

Manufactured by H. W. Hiller Valve Wrench Co., 747 Broadway, Lorain, O. Price, \$15.

Bu-Nite Pistons are not new, having been on the market two years. The design as shown, however, is a development that has been brought about by continued practical tests, and the results are satisfactory to the extent that the manufacturer guarantees to satisfy the customers with the results obtained.

The reduction in weight of a piston is a very important factor. It should not be



made too light, however, as it is subjected to extreme heat and the most severe punishment of any part.

The material must be of superior quality, having bearing efficiency, tensile strength and the ability to transfer the combustion heat into the cooling system.

The manufacturer claims that the Bu-Nite pistons have these qualifications, developed from the raw material in their foundry, where practical tests have proven that the ability of the material to maintain ring seats, piston pin bearings and the diameter of pistons, also the tensile strength and the ability to conduct the heat out of pistons. These qualities are due to the nickel contents and snug fit, permitting contact to cylinder wall by use of the compensating skirt and expanding ring, and are the encouragements to make the guarantee.

The advantage gained by being able to transfer the heat is of no little importance, due to the ill effect of breaking down the lubricating oil and forming carbon under the head of the pistons, which is in turn absorbed by lubricating oil, causing excessive wear on bearings and moving parts.

Manufactured by Butler Manufacturing Co., 3234 West Washington Street, Indianapolis, Ind.

The Oval Stop Signal is a new and improved signal device which has a number of improvements and refinements which are specially featured. The materials used in its construction makes it impossible for the Oval Signal to rust, it is stated, while the parts have been assembled in such a manner that the signal cannot rattle nor can dust or water get inside.



The manufacturer states that every part of the lamp is of heavy gauge brass, heavily nickel plated, inside carries a beautiful silver mat finish, while the outside is finished in either highly polished nickel or double-coated with high-heat baked black enamel. Either finish will withstand all weather conditions.

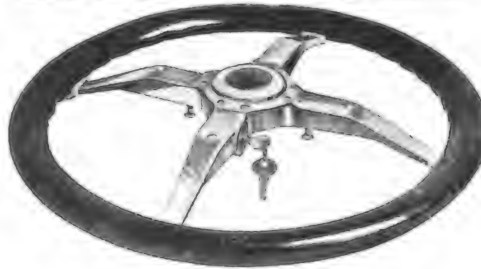
The word "Stop" is embossed on the best grade ruby glass with fire-baked black enamel background to make it visible in both daylight and darkness. A 21 candle power bulb furnishes the flash.

The switch is of a patented design, working like the hook of a telephone.

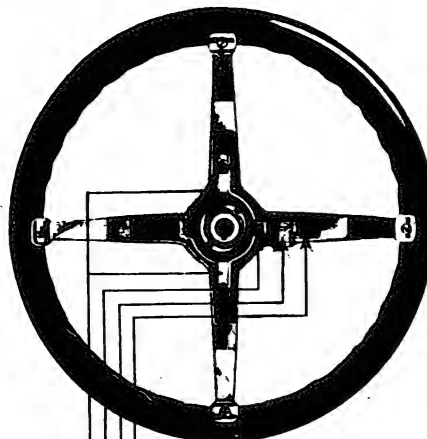
The signal derives its name from its "oval" shape.

Manufactured by Silva Manufacturing Co., Cincinnati, O. Price, \$7.50.

The New Lazear Lock Wheel for Fords is the type which, when locked against theft, spins freely upon the steering post. Thus it makes it impossible to steer the Lazear locked Ford. The lock itself formerly was placed so that it was necessary



to insert the key from the underside of the wheel when unlocking it. This has been changed so that now the key is conveniently inserted from the side of one spider arm. Though unlocked in this manner no key is required to lock the wheel, as this operation is controlled by



LOCKED
AGAINST
THEFT

COLD ROLLED STEEL SPRING.
CORBIN LOCK.
COLD ROLLED, CASE HARD-
ENED LOCKING BOLT IN
LOCKED POSITION.
POSITION OF CLUTCHES
WHEN WHEEL IS LOCKED.

two thumb knobs placed on the underside of two arms of the spider. By pulling down and pushing back these thumb knobs the two hardened steel clutches, which secure the wheel to the steering post collar when in driving position, are drawn back and the locking bolt allowed to slide into position, permitting the wheel to spin freely on the steering post. This is all accomplished without in any way effecting the gears of the steering post.

The entire locking mechanism of the wheel is contained within the spider, and is completely protected by a wall of steel

which is claimed to be saw, file and chisel proof, around which the aluminum spider is die cast. Die casting of the spider insures absolute accuracy and the perfect functioning of various parts, it is said.

Another important improvement and one which dealers will appreciate is the case hardened steel screw cap on the Lazear wheel. Formerly the cap was put on and locked rigidly in position by a spring inset. On the new type the cap is made of cold rolled case hardened steel and screws into position, thus it permits easy removal for transferring the wheel to another car or for adjustment. When the wheel is locked against steering this screw cap also is locked securely by the locking bolt and cannot be removed.

Manufactured by the Lazear Products Co., Chicago, Ill., successor to the Lazear Auto Lock Wheel Manufacturing Co. Price and literature on request.

Herz Hammerblow Timer for Fords has been designed to meet certain conditions in the Ford magneto system, due to the high frequency of the electrical current used for ignition purposes. The timer consists of a hardened tool steel rod held in its place by a spiral spring pressed against another hardened tool steel stud when the cam actuating the instrument rotates. This gives an exceedingly intimate electrical contact, which is abruptly broken with the passage of the cam. The breaking of the current is sudden, which accounts for the saving of gasoline claimed in connection with this instrument.

It is common knowledge that occasional trouble in the Ford car comes from the vibrator on the coil which, being operated by a high frequency current generated in the flywheel, has a tendency to lag and to give inaccurate ignition. The sudden interruption of the current in the Hammerblow Timer tears off these would be sticking vibrators, which are thrown into action with every rupture of the current, giving the so desired regular click of the motor at low speed. With the Herz Hammerblow Timer, it is stated that the Ford motor can be run with a reduced flow of gasoline and the manufacturers guarantee that in each and every case it is possible to reduce the flow of the gasoline by a quarter turn of the rod immediately upon the application of this new Herz timer. The engine also idles much slower and picks up quickly, it is claimed.

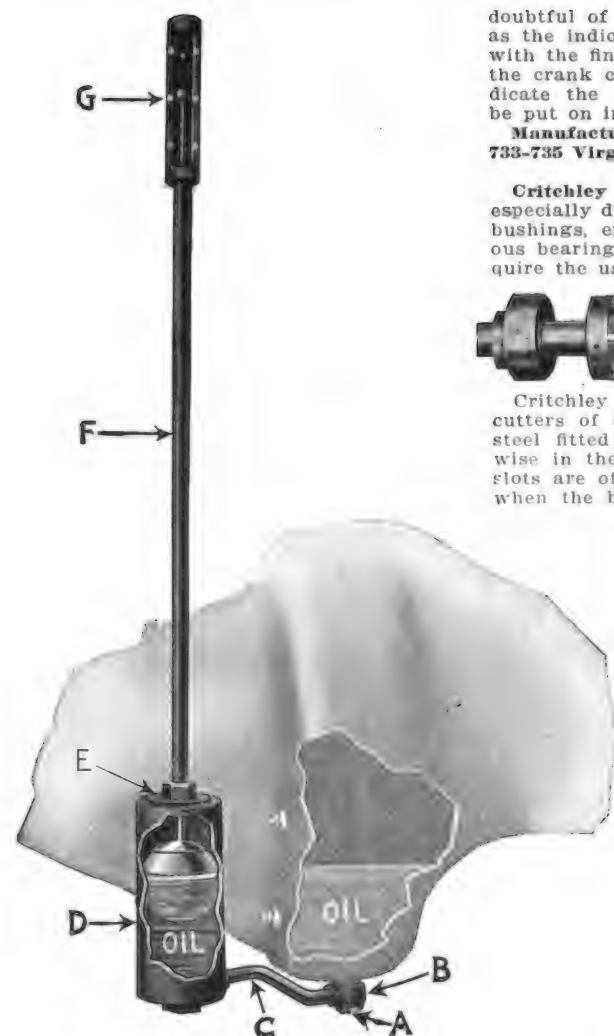
The construction of the timer is exceedingly sturdy, as can be seen from the cut. The housing is made of cast manganese bronze, the moving parts are of hardened nichrome steel of specific char-



acteristics. There is no part to wear or to give way. The Herz timer, it is claimed, will last as long as the Ford motor and the saving in current pays for the instrument, the price of which is only \$5, in a very short time.

Manufactured by the Pro-Mo-Tor Fabricating Corporation, 182 Locust Avenue, New York City. Prices and literature on request.

(When Writing to Advertisers, Please Mention the Automobile Journal.)



The P. C. Dash Light Reading Oil Gauge is said to be appealing to the trade in general, more especially fleet owners, as it is claimed to materially reduce the oil consumption and raise the efficiency of the car by maintaining a proper oil level. It is claimed that the average driver or the attendant in charge of oiling the cars in the garage does not take the necessary time to really test the oil level, with the consequence that rather than take a chance of running out of oil, more oil is poured into the crank case than is necessary, resulting in excess carbon, extra valve grinding, fouled spark plugs and the extra oil being burnt up and wasted, whereas it is claimed with a P. C. Oil Gauge with its convenient location on the dash, oil inspection cannot be overlooked or slighted.

It is said that records on oil consumption show a great many Fords giving as low as 38 miles to the quart of oil, where if the oil level is properly looked after, at least 150 miles should be obtained from one quart of oil, and statistics are offered by the manufacturer to show that fleet owners are saving from one to three quarts of oil per week per car by using the P. C. Gauge.

From the standpoint of the individual owner the gauge is of great value since it likewise reduces the amount of oil used in the individual's car and at the same time makes it unnecessary for the owner to get down on his hands and knees and otherwise soil his clothes, to find the correct oil level.

This is accomplished by the height of oil in the crank case being registered through a simple, but effective float chamber with a luminous indicator on the dash that is before the driver at all times. The indicator is so constructed that the gauge can be tested in the event the driver is

doubtful of the amount of oil registered, as the indicator ball can be forced down with the finger, and if there is any oil in the crank case the ball will rise and indicate the right level. This gauge can be put on in 15 minutes by anyone.

Manufactured by the Parts Corporation, 733-735 Virginia Avenue, Indianapolis, Ind.

Critchley Expanding Reamers are especially designed for reaming piston pin bushings, engine cylinders and the various bearings about the tractor which require the use of bushings in replacement.



Critchley expanding reamers have five cutters of special alloy, semi-high speed steel fitted to parallel slots cut lengthwise in the shaft of the reamer. These slots are of sufficient depth so that even when the blades are forced to their extreme limit they are sufficiently deep in their slots to hold firmly and will not spring out. The blades are bevelled at each end and are confined to their positions by special nuts. To increase the diameter of the reamer it is only necessary to slack up one nut and screw up the other.

Critchley cylinder reamers are of shell type with tapered slots having eight semi-high speed steel cutters, with top and bottom guide fitting top and bottom of block.

Manufactured by Chadwick & Trefethen, 32 Bow Street, Portsmouth, N. H. Price, each, \$35. Set No. 10, including 10 reamers from 7/16 to 1 1/4 inches inclusive, put up a neat case, \$51.30.

The Dumore Upholstery Cleaner, a new vacuum cleaner, designed and built primarily for cleaning the upholstery of closed cars, has just been put upon the market. Every owner of a closed car knows what a problem it is to get rid of the dust and dirt that settles in upholstery. It is the most difficult kind of dirt to dislodge, and yet it quickly yields to the Dumore vacuum method, states the manufacturer. The powerful suction rapidly draws the



grit into the dust sack as it is loosened from the upholstery.

The cleaner is easily carried about from place to place and very convenient to operate. When in use it is placed on the ground outside the car, away from the operator, so as not to interfere with his

work. A 10-foot length of flexible hose is furnished, on the end of which is attached a swivel hand grip or nozzle. This construction permits freedom of motion at all angles, regardless of how much the hose is twisted about. The brushes, of China bristle and leather bound, will not injure the most delicate fabrics. The motor is a Dumore universal type, and operates on either direct or alternating current. The base is hard wood with an ebony finish, on which is located a kick type switch.

Many automobile owners find additional uses for the Dumore by carrying it into the house and cleaning upholstery, draperies and garments. The cleaner comes complete with 25-inch portable cord and attachment plug. Its net weight is 13 pounds.

Manufactured by the Wisconsin Electric Co., Racine, Wis. Price and literature on request.

The Norwesco Windshield Cleaner, a device recently placed on the market, is unique in construction and beautifully finished in either nickel or black japan. The cleaner is made of spring steel with pure para rubber scraper.

The cleaner makes it possible to clear the windshield from extreme left to right,



giving the car or truck operator a clear vision of the road regardless of weather conditions, a feature which tends to prevent accidents.

Manufactured by the Northwestern Chemical Co., Marietta, O. Price and literature on request.

The New K-D Head Lamp for Ford Cars is of the popular drum type known by the stock number nine, and is drawn in one piece from suitable gauge metal with all plated parts made of brass, highly finished and absolutely dust-proof.



The finish is either nickel or black and nickel as desired.

Although the lamp has just been placed on the market, jobbers have responded to a surprising degree with orders for immediate and future delivery, states the manufacturer who further states that The K-D Lamp Company has been compelled to pay special attention to additional production in order to manufacture these drum shape head lamps in sufficient quantities to take care of orders.

Manufactured by the K-D Lamp Co., 108-10 W. 3rd Street, Cincinnati, O. Price and literature on request.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

A New Rego Garage and Battery Service Station outfit selling at a moderate price has been recently announced which fills the needs of many service stations.

The outfit consists of a new style combination welding and cutting torch with a capacity for welding up to $\frac{3}{4}$ inch steel and for cutting up to one inch steel. The torch known as Rego MT, alone is priced at \$30, with five welding tips made of drawn copper. The cutting tips for cutting up to one inch steel furnished with the outfit are priced at \$2.25 each. In addition to the torch the outfit includes regulators, hose and accessories, and a new lead and sheet metal welding torch. This torch, Rego B, is furnished with a tip about three inches long, especially designed for welding cracks in automobile

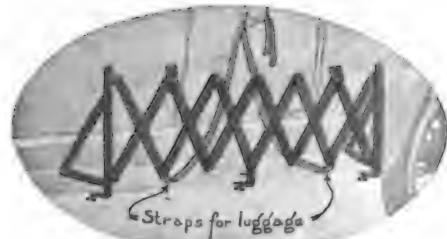


radiators. Rego B torch alone with three lead welding tips and one radiator welding tip sells for \$5 if for use with acetylene or hydrogen, and \$9 if for use with city gas. The outfit also includes Dunham's book on automotive welding, which is recognized to be one of the best books for the practical welder.

The new outfit and more detailed description of its contents are described in the new Rego catalogue No. 23, copies of which may be had upon request.

Manufactured by the Bastian-Blessing Co., W. Austin Avenue, at La Salle Street, Chicago, Ill. Price, \$90.

The Aurora Luggage Carrier is designed to fit the running board of practically any car, while straps hold the luggage in place, preventing its working loose. The all-steel collapsible construction extends the full length of the running board when in use or may be collapsed to support one piece of baggage only. When not needed it may be entirely collapsed and stored in the space



under the seat. Clamps fasten the luggage carrier to the running board, while steel strips form the framework of the sides, which are riveted at the ends to allow the carrier to collapse easily.

Manufactured by the Mor-Air Auto Pump Co., Inc., Aurora, Ill. Prices and literature on request.

The Black & Decker Safety Cleaning Machine consists of a cast-iron pedestal with a bowl on the top 13 inches in diameter and eight inches deep. About four inches from the bottom of the bowl a perforated metal disc, covered with a fine mesh brass screen is supported. The space below this disc is the sump. The sump holds about one gallon of gasoline, kerosene or such liquid cleanser as it is desired to use.

A plunger pump is cast integral with the bowl at one side in such a manner as

to squirt a stream of the cleansing fluid from the side of the bowl near the top towards the center. The bowl is provided with a safety cover, arranged so that it cannot be left open. This cover may be lifted by means of a convenient handle, which is also used to operate the plunger pump when the cover is lifted.

To use this machine it is merely necessary to open the cover and operate the plunger pump by means of the handle which squirts the stream of cleansing fluid towards the center of the bowl and the part to be cleaned is held under the stream of cleansing fluid, which washes



off the dirt chips and other foreign matter, and deposits the material which is washed off on the screen. The liquid drops through the screen into the sump and can be used over and over again.

This machine eliminates fire risk and prevents the wastage of gasoline, kerosene or other cleansing liquid.

It is particularly useful for cleaning ball bearings, roller bearings, gears, parts of magnetos, distributors, starting motors, generators and, in fact, any part which can be introduced under the cleansing stream, including drills, milling cutters and various other kinds of tools.

The Black & Decker Safety Cleaning Machine bears the approval of the fire underwriters. It eliminates the dangerous and wasteful "bucket and brush" method of cleaning.

Manufactured by the Black & Decker Manufacturing Co., Towson Heights, Baltimore, Md. Price, \$56.

The A. R. G. Auxiliary Spring for Ford cars is said to form a combination shock absorber and spring protector, which reduces the rebound and prevents serious mishaps to the front end. It also does away with the danger of broken front springs, worn out spring hangers, tires cut by fender irons and steering arms locked on radius rod.



The A. R. G. fender brace, for Ford cars, is claimed to prevent rear fenders from cracking, stop vibration and rattling, make the fenders last as long as the car and does not interfere with the use of any shock absorber, it is stated.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

The manufacturer claims the A. R. G. springs, also made by the company, will make the car ride more easily and silent.

Manufactured by the A. R. G. Auxiliary Spring Co., Birmingham, Ala.

The Neverout Garage Heater is manufactured as a solution of the isolated private garage and a method of keeping the circulating water warm during the cold winter months. The device consists of a kerosene heater fitted with an extended hood of sufficient length to reach the car radiator at the front, supplying warm air to the radiator core to keep the cooling medium at a suitable temperature



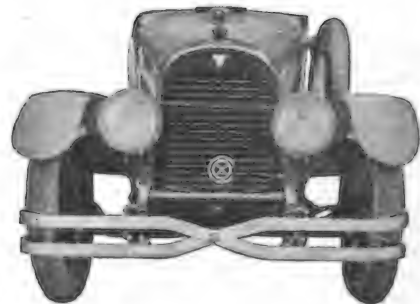
for instant starting even on the coldest of days, it is claimed. Special hoods are provided at an extra cost which enable the heater to be operated over a bumper.

Other winter specialties offered by this company include electric hand grips or wheel hand warmers operated by electric current from the storage battery of the car, electric engine heater operated by current from the garage lighting circuit, electric carburetor heater operated from the storage battery of the car, etc.

Each of these devices occupy a field of their own and are sold at popular prices. Nothing but the best of materials and workmanship enter into their construction and each device is guaranteed by the manufacturer.

Manufactured by the Rose Manufacturing Co., 37th and Filbert Streets, Philadelphia, Pa. Prices and literature on request.

Hylo Bumper Model B has a style and appearance which is distinctly different from the average bumper. The four loop springs forming the bumper are connected in the center by a rigid arch which, it is claimed, greatly strengthens the bumper and prevents vibration. As the loop springs extend entirely across the front of the car they furnish a six-inch impact surface, designed to fend off any protruding parts of other cars which might find



their way above or below the ordinary two-inch bumper. The wide impact surface also helps to distribute the force of the impact and absorb the shock with the least possible strain or noise. Made for fronts and rears of all models of cars.

Manufactured by Cox Brass Manufacturing Co. of Albany, N. Y., and Cleveland, O. Price on request.

LEGAL POINTS

By SAMUEL WANT

THE evidence in a recent Missouri case discloses that when a car was receiving gasoline from a public station, some of the gasoline escaped from the hose, caught fire and burned the car. There was no explanation of how the gasoline became ignited or who did the act which started the fire. The motorist sued the owner of the gasoline station for his loss, and the court decided that in the absence of any evidence pointing to the cause of the fire the claim could not be upheld.

A RECENT decision in California adds that state to the number which give to the repairman of an automobile a claim superior to that of the holder of a chattel mortgage, although the mortgage is prior in date to the repairman's claim. The priority thus given the repairman is of a limited character. It does not cover such items as grease, gasoline or accessories which were not indispensable to effect the repair of damaged or missing parts.

Negligence.

ORDINARILY, where parties to an accident were each negligent, neither may obtain damages from the other for the resulting injuries. An exception to this rule is illustrated in a recent California case in which it appeared that a motorist passed to the left of the center of a street in "cutting the corner." At the same time another car was coming from the opposite direction, on the wrong side of the street, at a high speed. As the first car got to the right side of the street the two cars collided. In passing upon this situation the court said:

"That the driver of the first car was guilty of negligence may be admitted. But such fact will not bar his recovery, unless it be made to appear that such negligence was a part of the efficient cause of the collision; that is, there must have been a casual connection between his negligence in so doing and the injury complained of. At the time when the collision occurred, as shown by the record, the driver of the first car was driving his car upon the right-hand side of the center of the street, where he was entitled to travel, and the fact that in reaching such position he had negligently cut across the corner of the intersecting street was not a contributing cause of the collision, but, as appears from the evidence, wholly disconnected therefrom.

Clearly he was where he had a right to be and where, but for the fact that defendants were on the wrong side of the street and traveling at an unlawful rate of speed, the collision would not have occurred."

Railroads.

ONE of the ever-growing number of collisions between trains and automobiles at railroad crossings is dealt with in a recent federal case decided in Iowa. The case was a claim for damages by an injured motorist. His claim was based on the alleged failure of an oncoming train to give the customary warnings as it approached the crossing. The railroad's defense was that, granting the motorist's claim, the accident could not have happened if the motorist had followed the "stop, look and listen" rule before entering upon the crossing. In rendering judgment in the railroad's favor, the court gave the following definition of the rule referred to:

"The duty to stop is a relative one. It depends upon the situation of the particular case, the knowledge of the traveler has of the situation, and the reliance he may reasonably place under the circumstances on his opportunities for seeing and hearing without taking the last precaution of stopping. The authorities are quite in accord on the proposition that, if the view is unobstructed, so that an approaching train, before it reaches the crossing, can be seen, there is no occasion for special exercise of the senses of hearing and listening, and therefore there is no reason why he should stop for that purpose. On the other hand, if the view is obstructed, interfering with the sense of sight, then he must bring into requisition the sense of listening carefully and attentively; and if there is any noise or confusion over which he has control, such as that of the noise of horses feet, or the grinding sound of the wheels, or the ordinary noise of the vehicle, interfering with the acuteness of the sense of hearing, it is his duty to stop such noise or interfering obstruction and listen for the train before going upon the track."

Liquor.

A CASE just decided in a federal court in Pennsylvania seems to be the first judicial construction of the provisions of the national prohibition act relating to the forfeiture of an automobile used for the unlawful transportation of liquor. The car in this case had been loaned by the owner to a friend. The latter was arrested for using the car to transport liquor and was convicted. According to the evidence the owner of the car had no knowledge of the unlawful use intended to be made

of it. The federal prosecutor, nevertheless, insisted that the car was subject to forfeiture by the government. His contention was based on the fact that the forfeiture provisions of the law contain no exceptions in favor of innocent owners in such cases. The court refused to construe the law that way. It said:

"The admitted facts in the present case show ownership and want of knowledge on the part of the vehicle's owners as to the purpose for which the vehicle was to be employed. Without any other attending circumstances this is sufficient to warrant the court to order its return. It might be otherwise, if, from the reputation of the person intrusted with the vehicle or other circumstances attending his occupation or employment, the inference would arise that the owners had reasons to suspect that their property might be used for the purpose it was employed."

This is in accord with the decisions of the state courts under the various local acts.

White Slave.

A RECENT decision of the court of appeals of the District of Columbia holds that a chauffeur who drove two women across the Potomac to a point in Virginia for the purpose—known to him—of enabling them to meet men for immoral purposes, was guilty of violating the federal white slave law.

Fraud.

IT IS not always easy to determine when a misrepresentation will justify a purchaser of a motor car in rescinding the transaction. The rule is expressed to be that if the purchaser knew and saw what he was buying, the fact that there was a misstatement by the seller is immaterial, provided there is no actual fraud. In a case just decided in New York a man bought a used car that was represented to be a "Cadillac sedan, model 57 V." He saw the car that he was buying, was satisfied with it, paid the price and took possession. Later he discovered that the car was a Cadillac touring, model 57 J, with a special body. He then sued to recover his purchase money. The seller proved that he too had bought the car as a Cadillac sedan, model 57 V, and did not know of his error when he sold the machine to the plaintiff. The court decided that the plaintiff was not entitled to have his money returned.

Damages.

IN SUITS for damages for injuries sustained in automobile accidents the most serious claim against the motorist is frequently an assertion that as a result of the accident the claimant's

health and earning capacity have been permanently impaired. The West Virginia Supreme Court, in dealing with such a claim, held that damages on this ground were not recoverable upon mere proof of tubercular tendencies and other physical impairment disclosed by an examination after the accident, where the testimony left some doubt as whether these conditions had existed before the accident. The court held that the rule of law on this subject is as follows:

"Future consequences, which are reasonably expected to follow an injury, may be given in evidence for the purpose of enhancing the damages to be awarded. But to entitle such apprehend consequences to be considered by the jury, they must be such as in the ordinary course of nature are reasonably certain to ensue. Consequences which are contingent, speculative, or merely possible are not proper to be considered in ascertaining the damages. * * * To entitle a plaintiff to recover present damages for apprehended future consequences, there must be such a degree of probability of their occurring as amounts to a reasonable certainty that they will result from the original injury."

Injuries.

ORDINARILY a person cannot obtain damages for injuries sustained in an accident unless he can prove some specific act of negligence as the proximate cause of the accident, and the act must have been done by or on behalf of the defendant. An exception to this rule is that the mere happening of the accident, without proof of negligence, will give rise to a claim for damages by the injured person, if the cause of the accident was some unusual thing which in its very nature suggests negligence as its primary cause. For example, where the shaft of a wagon is driven into the rear of an automobile, this is usually in itself ample proof of negligence, entitling the motorist to damages. But in a recent New York case involving just such an accident the evidence showed that an automobile struck the rear of the wagon, driving it forward, and causing the shaft to strike an automobile just ahead. The court ruled that these facts absolved the owner of the wagon from legal responsibility to the injured motorist in the front car.

Mortgage.

WHERE a law makes it a penal offense to "sell or dispose of" mortgaged personal property unless the mortgage debt is paid, a crime is committed if an automobile owner, after mortgaging his car, removes it to another state. This was decided recently in a South Carolina case.

In another South Carolina case it appears that an oil company installed a gasoline tank in front of a dealer's store under an agreement of the latter that the tank was to remain the company's property, subject to removal by it when the dealer discontinued selling the company's gasoline. The dealer was thrown into bankruptcy by his creditors and his assets were sold as a

whole. The purchaser claimed that the gasoline tank was included in the sale, while the oil company asserted its reserved ownership under its agreement with the dealer. The court decided that the agreement was not legally binding as against the bankrupt's creditors, because it had not been recorded, and that therefore the purchaser at the bankrupt sale obtained a clear title to the tank.

Names.

WHAT'S in a name? A great deal, according to the courts, if the name is Hudson and is applied to conflicting products in the automobile field. A New Jersey corporation known as the Hudson Tire Company, manufactured and sold tires under the "Hudson" brand. A corporation was subsequently organized in New York under a substantially similar name, and sold tires under that name. It claimed the right to do so in New York, and to designate its tires accordingly, because the State of New York had granted it a charter fixing its name as indicated. But the New Jersey company was doing some business in New York and therefore brought suit to prevent the use of the brand "Hudson" on tires sold in New York by its rival. The court held its complaint justified and granted an injunction.

Trolleys.

A MOTORIST has a right to assume that street cars are running within the lawful speed limits. Accordingly, where the driver of an automobile proceeded to cross street car tracks in full view of an approaching car and a collision resulted because of the excessive speed at which the car was going, the failure of the motorist to properly estimate the leeway for crossing in front of the car cannot be regarded as contributory negligence to exempt the car company from liability for the accident.

Collision.

A CURIOUS tripartite accident is disclosed by a California decision just rendered. A touring car and truck collided, and after being extricated from the entanglement the truck struck a third vehicle, before it could be brought to a stop. The defense of the truck owner was that the collision with the touring car had created a sudden emergency, and although he admitted negligence in managing the truck, he relied upon the legal rule that a person in peril, where immediate action is necessary to avoid disaster, is not legally responsible for a failure to exercise the care and presence of mind required under normal conditions. While conceding this rule, the court decided that prior to the accident with the touring car the truck was proceeding at an excessive speed, and that the momentum of this condition was still present when the second collision occurred. Hence the truck owner was liable for the collision.

Automobile Theft.

IN A CRIMINAL prosecution for the theft of an automobile the law will not permit the admission of evidence

of other thefts of cars alleged to have been perpetrated by the defendant. A recent Alabama decision reversed a conviction on this ground. The court points out, however, that if the other thefts had occurred at the same time, or as a part of a continuous series of thefts, following immediately one upon the other, proof of the other thefts would have been admissible in evidence. The decision in this case is based upon the rule that a defendant in a criminal case cannot be compelled to answer or meet any other charge than the one specifically set out in the indictment.

Joint Liability.

IN A RECENT Indiana case the question was whether there was a joint liability on the part of two corporations for an automobile accident. The two companies were engaged in hiring automobiles. They used the same office and garage, had a joint bookkeeper and telephone operator, and frequently used each other's cars and employees. The accident in question occurred when the chauffeur of one of these companies was driving a car owned by it, and for its business purposes. Upon this state of facts the court decided that the other company was not jointly liable for the accident.

Law Quirks.

A RECENT California case decides the two following interesting propositions of law:

(1) The law regulating the use of lights on motor vehicles applies to a train of vehicles consisting of a tractor motor to which was attached a wagon, an oil carrier and a vehicular cooking house.

(2) An automobile insurance company which pays or assumes payment of a loss on a policy issued by it, has the same right to sue the other party to the accident for damages that the insured motorist would have.

Liability.

WHERE the owner of a car drove in it to his country club and there delivered it to a repair man to be taken by the latter to a garage for repairs damages could not be recovered from such owner for an accident which occurred during the trip to the garage and which was due to the driver's negligence.

Write to the automobile editor if you have any perplexing questions.

Because of importance of motor trucks and tractors, an annual market for 60,000 head of horses has been destroyed and demands for hay and corn reduced approximately \$88,000,000.

Riding a motorcycle is the principal hobby of Daniel Frohman, a prominent theatrical producer of New York City.

Schools and colleges throughout the United States are to be enlisted in a national way to teach the coming generation all about highway engineering, automobile transport, traffic regulations and safety.

Rebuilding The Storage Battery

Intricate Problems of Overhaul Simplified—Design, Construction and Operation of Important Unit Explained in Detail by Prominent Authority.

(By WILLIAM DEVLIN.)

BATTERY service stations are maintained by manufacturers of storage batteries in practically all large centers of trade. Stations of this type are usually managed by a factory expert, who un-

Good Equipment Essential.
Each class of work calls for certain more or less special appliances. A few small miscellaneous tools also will be required and are used in various ways throughout the work. The equipment for battery repair work need not be expensive, but should be of good grade and re-

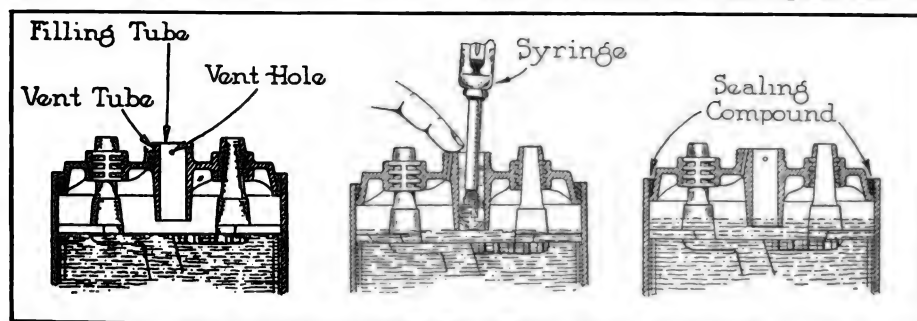
battery case. Side cutting pliers are probably the best for cutting wires and trimming some of the small lead parts.

The terminal nuts are often removed with the combination pliers and these nuts are frequently damaged while removing. It is a better policy to provide a set of S wrenches which will fit all the nuts and which will make the removal easily and without damage. Certainly it is a more workmanlike method to follow.

The sealing compound is removed from around the cell tops when opening the battery; and this compound is trimmed when sealing by a putty knife, a six-inch screwdriver and a $\frac{1}{4}$ -inch wood chisel with the point slightly dulled. These three items are necessities and several of each will prove handy.

The workman should be provided with a large size acid-proof apron and may also use sleeve protectors of similar material to good advantage.

In case one man is employed in handling the elements and other parts wet with electrolyte he will require rubber gloves, or at least rubber finger cots for two or three fingers of each hand. Without such protection the skin will soon become so tender that good work will be difficult. It is also advisable to cover aprons, gloves and shoes with oil or paraffine wax as a preservative against the acid. Gloves will last much longer



Method of Filling Battery and Proper Level of Solution After Being Filled. Note Finger Covers Vent Tube, Preventing Excess Filling.

derstands battery construction and operation from a practical as well as a theoretical standpoint, and motorists who patronize stations of this type usually have no complaint to make of the service received.

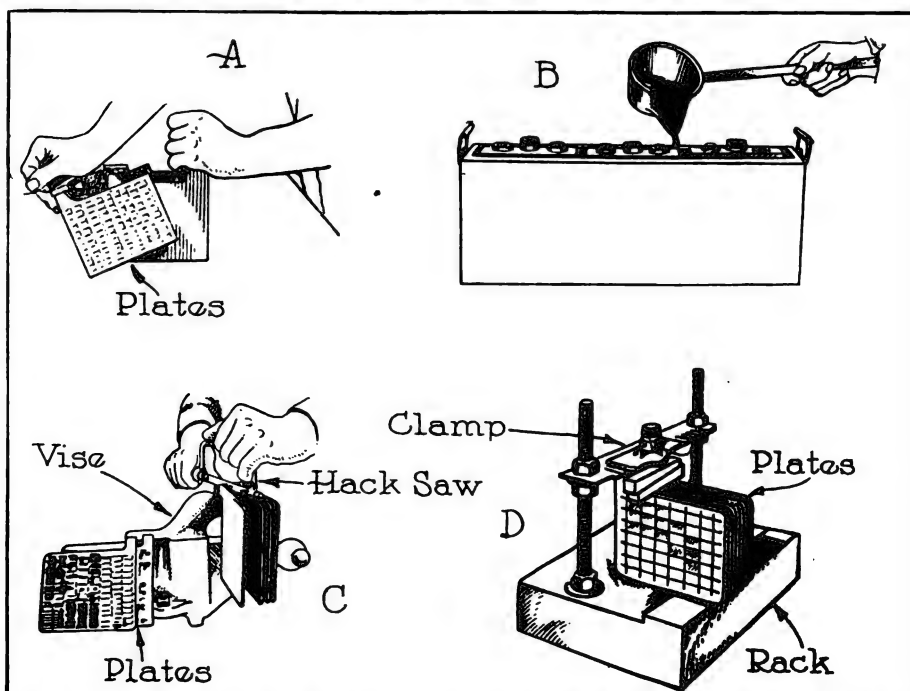
CUSTOMERS are urged to have the battery of the car tested at regular intervals, at these times having the terminals cleaned and tested for tightness and distilled water added if necessary. In this manner a careful check is kept by the station of each battery and the owner has the satisfaction of knowing that the factory making the battery is interested in his receiving the utmost service from it, and that it will function properly unless some other unit of the car goes wrong.

The ability to make satisfactory, workmanlike, economical repairs is the test of the efficient battery repairer. This ability can only be gained through doing careful and painstaking work according to accepted methods. In deciding on what repairs are necessary much depends upon the judgment and experience of the repairer, who should always balance the probable cost of the work against the length of service that may be expected from the battery in the future.

Good tools and equipment should be provided as they are necessary if high grade service is to be given. Service stations would not think of attempting mechanical repairs without proper facilities, and it is just as necessary that the battery service station be equipped with the essentials for this class of work.

liable make, as cheap tools and equipment are often made of soft metals that will not work satisfactorily.

Four kinds of pliers should be provided. Two pair, or more, of six-inch combination pliers can be used for handling terminal fastenings, connectors and many small parts. Long handled gas pliers will be found very handy for removing connectors, terminals and other elements from the jars. Flat nosed pliers, two pair, are used in pulling jars from the



A—Separating Elements. B—Pouring Sealing Compound. C—Cutting Out Plates. D—Plates in Rack Ready to Be Worked on by Repairman.

If rubbed in dry washing soda, after acid moistened parts have been handled.

Opening the Battery.

The first step in repairing is to open the battery and remove the elements for inspection. This work may be divided into three parts for purposes of explanation. First, the terminals and connectors should be disassembled; second, the cell covers loosened by heating the compound with a flame or with a steaming outfit, and third, the elements pulled out of their jars, or the jars removed from the case.

The first part of the work, removing the terminals and connectors, should be done as follows:

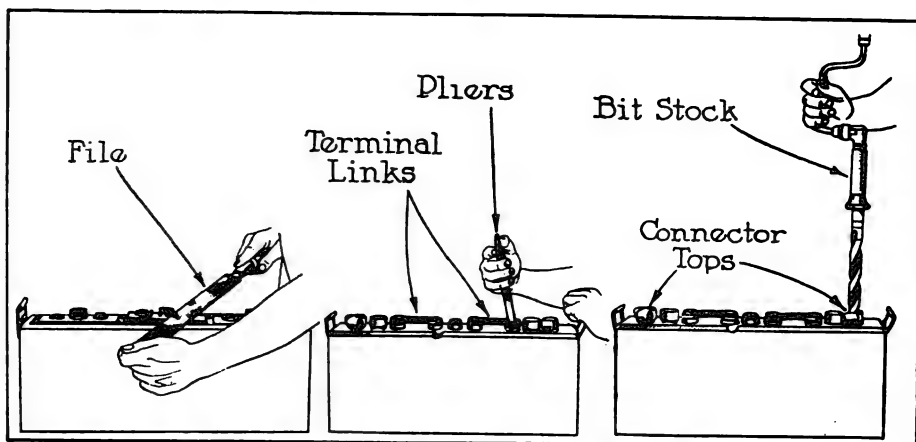
First, when the battery comes in, test the specific gravity and voltage of each cell, and also the discharge performance if convenient, and make a record of the results.

Second, make a sketch of the position of each of the terminals and also the position of the connectors, as this will simplify matters when reassembling.

Third, make a light center punch mark in the center of each terminal post, both for posts carrying the outside terminals and for those carrying the cell connectors.

Fourth, drill down into the lead of the terminal post, using the center punch mark as a guide. Drill deep enough so that the connectors and terminals are freed from the post, that is, so that the burned on taper joint is drilled away. Do not drill deeper than necessary to loosen the parts, as this will only make it necessary to do more building up when attaching these parts at the completion of the work. The drill used should be $\frac{5}{8}$ inch for $\frac{3}{4}$ inch posts, $\frac{3}{8}$ inch for one-inch posts, care being taken that the hole made is not too large. The drill may be used with a hand brace, a post drill, a portable electric drill, or a regular power driven drill press, depending upon the facilities of the shop.

Connectors and terminals can also be removed by melting the top of each terminal post in the center of the connector or ends or in the center of the terminals, by using the lead burning torch. While the lead is still molten the terminal or



Left, Using File to Break Connections. Right, Drilling Connector Tops. Center, Lifting Off Terminal Links by Use of Straight-Nosed Pliers.

connector is pried up from the top of the post and removed from the battery.

Fifth, remove the connectors and terminals by inserting the point of a screw driver under them, resting the screw driver shank on a metal strip laid along

the terminal posts. If the terminals and connectors do not come away readily the drilling or melting was not sufficiently deep and it should be made deeper.

Sixth, brush all of the lead trimmings from the top of the battery and wash away any collections of dirt or grease so that the entire top is clean.

Seventh, attach the terminals and connectors to the battery by tying them to the handles with lengths of wire. These parts are to remain thus until the battery is assembled again.

Eighth, remove the vent plugs and blow out the accumulated gas.

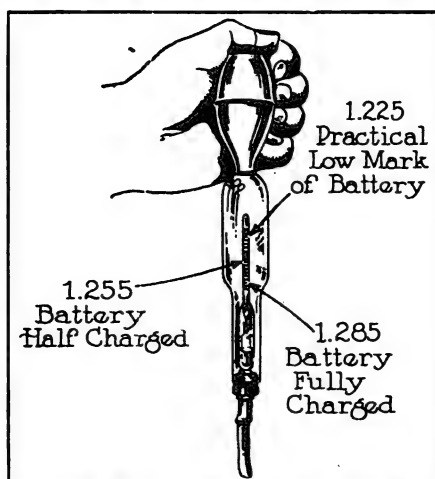
Opening Battery with Torch Flame.

If by chance the shop is not equipped with a battery steamer for steaming and softening the sealing compound, this work may be done with the flame of a gas and air torch or, in emergencies, from any form of torch using gas or gasoline, although care should be used that a workmanlike job may result.

If the battery is of the single cover type the torch flame is played around the edges of the cells until the compound commences to soften. The flame should be kept moving at all times and it will be found better to use less heat and a slightly longer time in this work so that there will be no danger of burning the covers.

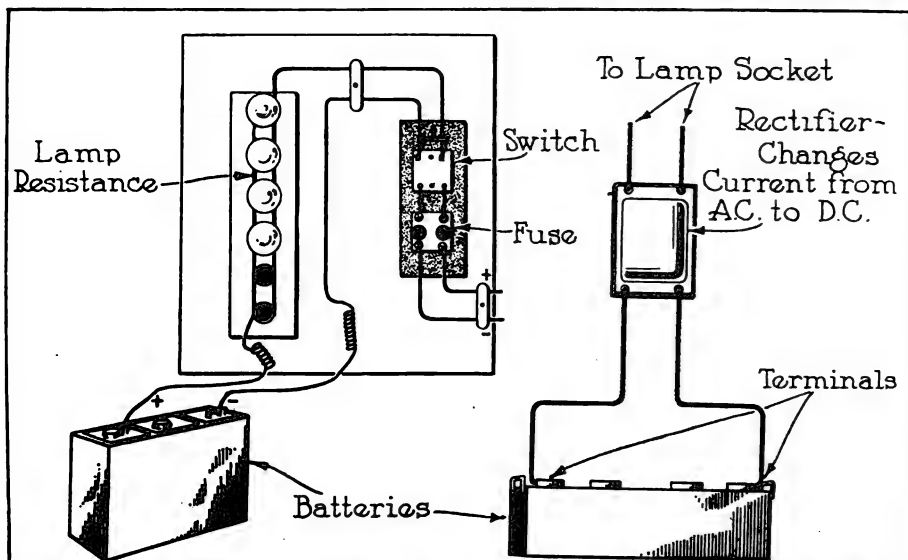
After softening with heat the compound can be dug out of the recesses with the screw driver or the wood chisel, heating either instrument for the work to facilitate removal, although the heat should not be sufficient to draw the temper. Heat again may be applied should difficulty be encountered, and the process continued until all of the compound is freed. A hot putty knife should then be run around the outside edge of the cover, between the cover and the jar, entirely freeing the cover. The cover as a rule is not removed from the element at this time, but is allowed to remain over the terminal posts while the element is being removed from the jar.

If the battery is of the double cover type, having a layer of sealing compound between the two covers, the compound is removed from around the edges as described above. The flame is then played over the surface of the top cover so that the underlying compound is softened and this cover is removed by working the screw driver or putty knife under the



Showing Battery Filling and Testing Syringe with Graduations of Interest.

the battery edge, then carefully prying up. These parts can also be removed by grasping them with the combination pliers or the gas pliers and pulling upward while gently moving them back and forth. Do not use enough force to bend



Left, Charging Battery by Using Lamp Bank Resistance. Right, Showing Use of Rectifier in the Circuit, Changing Current from A. C. to D. C.

edge of the cover and gently prying upward until the cover comes free. These covers should not be forced off, but sufficient heat should be used, to free them from the compound without straining.

After the top cover is removed, much of the warmed sealing compound from underneath may be dug out with a screw driver or putty knife, applying heat as needed to hasten the removal. The warm putty knife is then run all around the edges of the bottom cover and jar until this cover is free. With some types of battery cell construction the lower cover may now be lifted off while with other types it remains to be removed with the element.

Opening Battery with Steamer.

The necessary work of freeing the cell covers may be done more easily and quickly by softening the compound with live steam. Two general types of steamers are in use, the type most commonly employed is in the form of a small steam

cover battery 15 minutes steaming will be required. No particular steam pressure is necessary because upon escaping into the atmosphere the heat of high steam pressure would be quickly lost. If a gauge is attached to the steamer it should not read more than two or three pounds.

Many home made steamers are in use, these being made from any handy container that will hold water and a very moderate pressure of steam. Six outlet tubes, each fitted with individual shut-off cock, are usually fitted so that batteries of either six or 12-volt types may be handled, or so that two six-volt batteries may be steamed at one time. The tubes may be attached directly to the body of the steamer or may be fitted to a header pipe which is attached to the steamer body.

Usually when a steamer is used it is not necessary to dig any of the compound away with a screw driver or chisel, although the removal of the element and

ment should be rested on the jar with one corner extending down into the jar so that the surplus electrolyte may drain. While the elements are draining the cell covers may be removed.

The covers should be scraped free from any remaining compound by using the warm putty knife. The covers are then washed, and if warped at all, they may be placed in boiling water to soften them. With the covers softened they may be pressed into shape and, if they are flat, can be allowed to remain under a flat weight until again needed.

If no repairs are needed to plates or insulators, the elements should at once be placed in pure water or in a weak electrolyte while other repairs are being made. Exposure of the plates to the air for any length of time will result in hardening and over-sulphation of the negatives and in buckling of the positives. It will be found that exposed elements will soon become extremely hot and that they will often begin to steam as the remaining electrolyte is dried away by the excessive heat generated in the negatives.

With the elements drained, they should be laid on a clean spot on the bench and in such a position that the bottom edges of the plates may be inspected for buckling, breakage and for short-circuits between adjacent plates where the insulators have been worn away or cracked. This inspection should be very carefully made.

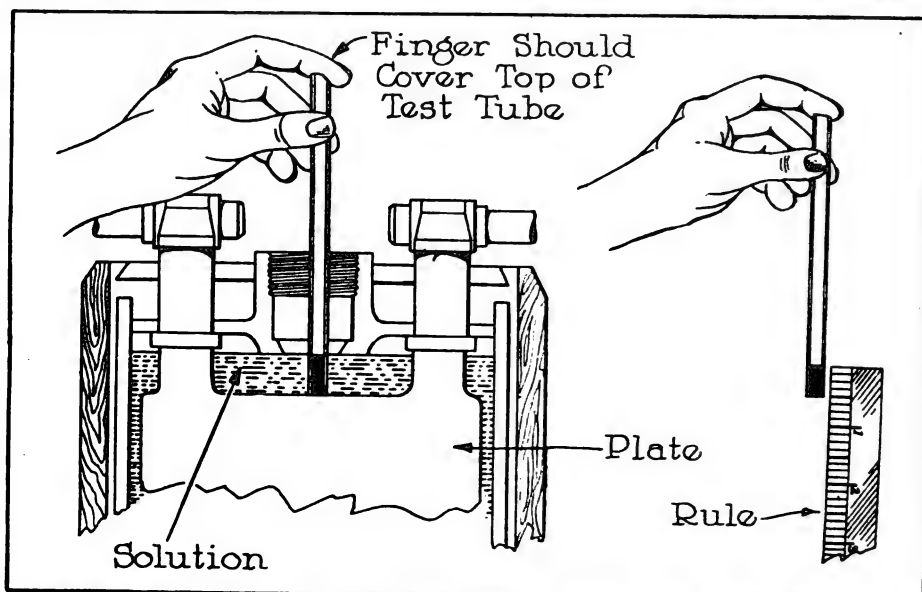
Removing Sediment from Battery Cells.

When the elements have been removed the remaining electrolyte is poured from the jars preparatory to cleaning the sediment from the jars. Often the electrolyte is poured into settling jars where, after the solid particles have dropped to the bottom, the clear liquid is drawn off the top to be used again. As a matter of fact this method should never be followed. It is better practise by far to discard the old liquid and use a fresh supply when reassembling the battery.

The case with its jars is placed on its side over the drain boards of a sink while a stream of water of good force is turned into the jars, one at a time, until all traces of sediment are removed. Sometimes it may be found that the sediment does not yield to the water alone and it will be necessary to scrape it away with a stick or putty knife. With all of the sediment removed the jars are easily examined for cracks and breaks.

The muddy deposit washed from the jars is composed of lead and lead compounds and therefore has a commercial value when sold for the recovery of the metal. The sink should be arranged in such a manner that the heavier portions of metal are retained in the bottom, and only the liquid has a chance to flow out of the overflow pipe at the top. A drain plug is placed in the bottom for use when it is desired to empty the tank and sell the lead and lead compounds.

Should it be desired to open a battery for the sole purpose of removing the sediment, a full charge should first be given and the elements then removed and placed in distilled water while the jars are cleaned. The elements are



Method to Ascertain Level of Solution, Finger Keeping Tube Tightly Covered in Lifting to Prevent Liquid from Running Out of Vial.

boiler having a number of outlets for live steam to which are connected lengths of rubber tubing. The free end of each tube is placed through the filler opening of each cell of the battery and the steam allowed to enter the cell until all of the compound has become softened.

Another type of steamer is in the form of an oven into which the entire battery is placed. Steam is admitted to the oven and this heat continued until the compound is softened. Such heating of the entire battery is of somewhat doubtful benefit to the jars and their fastenings and it is probably for this reason that the type first described is more generally used. Time is a factor which enters largely into battery repairing and the steamer has proved a more expeditious manner of opening.

A small metal washer is fitted around the end of the tube where it enters the cell so that most of the steam is retained where it will do the most good. In the case of a single cover battery steam is admitted for five or six minutes (by the check, not by guess), while for a double

cover may often be made easier if part of the compound is taken out in this manner. If the steaming is prolonged the condensed water should be removed down to the plate tops at intervals by drawing it off with a syringe.

Removing the Elements from the Jar.

The element, composed of plates, straps, terminal posts and insulators is generally pulled from the jar with the cell cover still in place around the posts. Should the element resist removal, the battery can be held down by using a clamp similar to those used by carpenters and joiners, or by a special clamp attached to the floor. If no clamp is available the battery may be held by the repairer's foot placed on the edge of the case, but outside the edge of the cover.

After the compound has been softened with the steamer or removed by using the flame, the flame is played around the edge of the jar for a moment, the two terminal posts are grasped with the pliers, and the complete element and cover is lifted from the jar. The ele-

again replaced, covered with electrolyte of 1.275 specific gravity and the battery again charged.

Repairing Battery Plates.

If work is required on the battery plates it is necessary to remove the cell covers so that the groups may be separated. Various methods are used for fastening terminal posts through the covers, many of these being apparent from an examination of different types of batteries in any battery service station. In certain types it will only be necessary to unscrew one or more packing units and remove the gaskets. In other types the posts are fastened with sealing rings that have been driven or forced into place. Such rings may be removed by tapping them with a small hammer on one side so that they are ex-

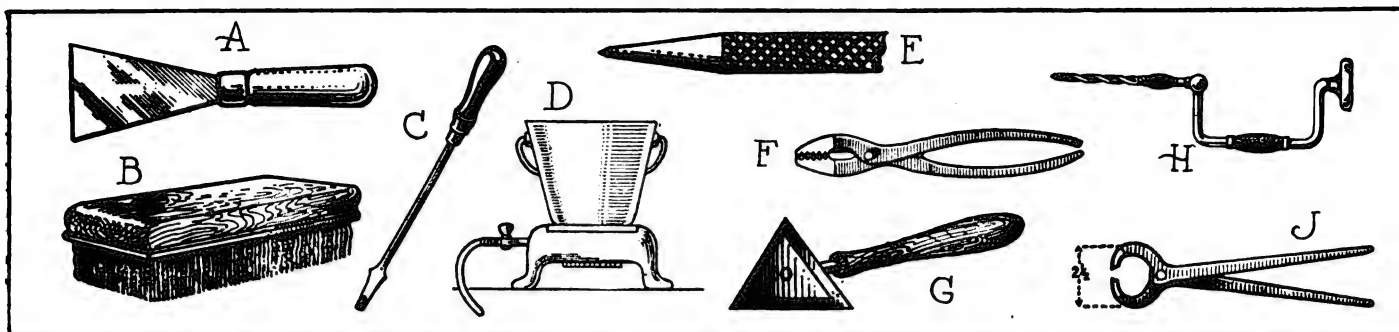
making up batteries for rental purposes. If the negatives are to be used with new positives in the repaired battery, they should be placed immediately in distilled water or weak electrolyte, to remain until ready for reassembling. The surface of the positive plates may be cleaned with a smooth piece of wood, but it will not be necessary to keep the positives in water or to wash them before they are reassembled.

Should the active material in the negative plates be bulged between the grid bars, the plates may be put into shape for further use by forcing the material back into place with a plate press. One should bear in mind, however, that this material will not regain its original characteristics of durability, porosity or conductivity and will have a tendency to

as is used in a carpenter's bench vise. An old letter press also works satisfactorily. Many stations use an ordinary steel vise, having four or five-inch jaws, and obtain good results. The press should be mounted so that the water and electrolyte forced from the plates may drain away into the sewer or into the wash sink.

Should the plates be only slightly warped, they may be reassembled with new insulators and pressed just enough to allow them to go into the jar easily. If the plates are badly buckled, however, it is best to straighten the groups separately before they are assembled with insulators between the plates.

It may be necessary to place boards of proper thickness between adjoining plates of a group. If buckling is excessive, it probably will be necessary to



Tools and Appliances Used in Battery Repairing and Overhauling, Which Will Be Found in Any Up-to-Date Repair Shop.

panded or they may be forced or cut from the posts. Many manufacturers fasten the posts through the cover openings with sealing compound which has to be warmed with a torch and then dug away to free the parts.

The insulators may be removed from between the plates by slightly spreading the plates apart and pulling the insulators with the help of a flat bladed knife. The usual way, however, is to grasp the terminal posts of the two groups and work them back and forth as the two groups are pulled apart. The insulators will then fall out onto the bench. Wood insulators should be discarded, while insulators of rubber and materials other than wood may be washed and saved provided they are unbroken and in good condition. It will then be possible to make a careful examination of the positive and negative plates.

If any of the plates have lost a considerable part of their active material, or if any of the material is found to be in poor condition, these plates are worthless and should be discarded. If the positive plate material, when tried with a knife blade, is found fairly hard, and if little material has been shed, these plates can be used again. If the negatives are found firm, but not extremely hard, they can also be used again.

The negative plates often are in better condition than the positives. Old negatives may sometimes be saved from a battery that is otherwise worthless. Such negatives should be charged and straightened in the plate press if found warped or buckled. They may then be kept in water or may be stored dry until wanted. This kind of material often is used in

shed from the plate at the first opportunity.

Using new positives with old negatives is a fairly common practise and under most conditions, when the negatives are in good condition, this practise is to be recommended.

It is seldom, if ever, advisable to use new negative plates with old positives because of the naturally shorter life of the positives. It may sometimes happen that only one or two plates of a group have been damaged and these would, of course, be renewed and the new plates used with the remaining old plates.

Using the Plate Press.

Buckled negative plates may be straightened and used again provided they are in otherwise good condition. That is, if there has been no great loss of material, if the material remains firm and if the grids have not cracked, the buckling alone may be corrected. Buckled plates should first be fully charged so that the hardened sulphate is removed and so that the active material is soft and rather pliable. This will also avoid much of the danger of cracking the grids in the press and will prevent loosening of the material which would be followed by excessive shedding when the battery is again placed in use.

If the plates are in good condition for pressing when they are removed from the battery, this work should be done before they are allowed to dry. In any case the groups to be pressed should be thoroughly wet with water before placing them in the press.

Specially designed presses are made for this class of work, but a home made press can be made which will do satisfactory work, by using a long screw such

start with boards that are quite thin in order to avoid cracking the plates at the lugs through bending them apart. After part of the operation is performed, the thin boards can be replaced with others that are just as thick as the distance from one plate to the next one. Heavier boards are placed over each end of the group to be handled.

The assembly of boards and group of plates is placed in the press or vise and pressure is applied gradually, avoiding unnecessary strains. The pressure is continued until the plates of that group have become straight or very nearly straight, after which they may be assembled with the opposite group in the usual manner.

Fitting New Insulators.

The battery repairer should never reassemble the element with the old wood separators that came out of the battery element, because they are sure to have deteriorated to some extent regardless of their age. The cost of new separators is too small to count in comparison with the results gained. Rubber insulators of the various types generally are used again provided they are undamaged and have been washed in running water for at least 15 minutes.

After a wood insulator has been once moistened, it should never be allowed to dry out until finally discarded. If insulators are purchased dry they should be immediately placed in a weak acid solution several days before being used in assemblies and should remain in this solution until used. If purchased in a moistened condition they should be put into the acid solution as soon as unpacked and should remain there until required. This is imperative.

One portion of the work bench should be set aside for use in handling insulators or that part of the bench used for this work should be thoroughly cleaned of all particles of metal as they tend to stick to the insulators entering the cells where they will form short circuits.

Insulators may be purchased of the correct size for the plates with which they are to be used, or a few standard sizes may be kept on hand and these may be trimmed to the correct dimensions as required for each repair job. The trimming is done with a special cutter or by one of the larger sized photograph trimmers. After the size is determined stops are placed on the bed of the trimmer and the insulators cut while held against these stops. The trimmer should be operated with a quick, full stroke.

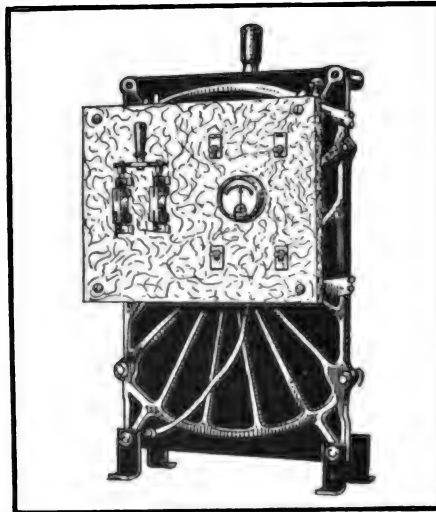
Insulators should be wide enough to project slightly beyond the edges of the plates at each side, their total width being determined by the inside dimension of the jar. Insulators should extend above the plate tops until they strike the hold-downs when these devices are used, or should extend enough above the plates so that their upper edge is slightly above the highest point of the plates when no hold-downs are used. The insulators should extend flush with the plate bottoms, or preferably a little way below the bottoms when first put in place. Insulators that do not meet these requirements will allow short circuiting from one plate to the next.

Should any type of hold-downs be used for aligning the parts of the elements, they should be inserted after the groups are placed in proper relation to each other, but before the insulators are in place.

When ready to insert the insulators the element is laid on its side so that the lower edge is supported a little distance above the bench top. The first insulators are put into the center of the element and the work is carried out to opposite ends. With wood insulators their ribbed side is placed toward the positive plate surface. Failure to observe this precaution will allow the active material from the negative plates to bulge and stick to the insulator ribs.

If rubber insulators are used in connection with the wood pieces, the rubber sheets are placed between the positive plate surface and the wood insulator, with the ribbed side of the wood toward the rubber. After the insulator is started in place it may be driven home with a flat piece of wood and after all of the insulators are in place the element may be carefully jounced down on the bench top to make the lower edges of the insulators come even with each other. The element with the insulators is then washed and if found slightly too large for the jar it is squeezed in the plate press.

If one or more jars are found upon examination to be cracked or broken, they must be removed and replaced with new. In some batteries the jars are held with clamps and bolts, but in a majority the jars are held in place with sealing compound.



Type of Resistance Rheostat Very Frequently Used in Battery Charging.

A damaged jar is made ready for removal by filling it with boiling water, which is allowed to stand for at least five minutes, or else by using a battery steamer and allowing the heat to continue for five minutes while a tube is inserted in the jar with the jar top closed with a loose cover.

After the sealing compound has been softened by the heat, two opposite edges of the jar are grasped with flat nose pliers or tongs and the jar pulled from the case with a steady upward pull out of the case. The interior of the case should be examined and any excess compound or other obstructions removed. A very small quantity of sealing compound may then be poured into the bottom of the case should it be found that additional height will be required to bring the top of the jar flush with others. In most cases nothing should be put underneath the jar.

Jars used for replacement purposes should be of good, fresh stock. Old rubber jars lose their flexibility and are then broken very easily. A jar in good condition should allow some movement of the walls, even when cold.

When the battery jar is ready for placing in the case it should be warmed by filling with hot water for a few minutes or by playing the torch flame around the interior. The jar can then be pressed down into place. The work will be easier and will be better done if a wood form is placed inside the new jar and pressure applied on the wood. The jar must be pressed well down into place until its upper edges are flush with the upper edges of the other jars of the battery. If the jars are a loose fit in the case, the additional space is filled by inserting spacers of thin paraffined wood between the jars or at either end.

It will be advisable to leave the cell connectors off until the cell with the new jar has been charged, because it may be found that this cell will call for more charging than needed by others in the battery.

The foregoing instructions can be used for reboxing a battery or replacing the old case with a new one. Sometimes the entire cell, with the elements in place,

will simply be removed from the old battery and put into the new case, but usually the elements will be removed for one reason or another.

The Cell Assembly.

After the necessary repairs have been made and the insulators put in place, the element should go into the jar without delay and should be covered with electrolyte of the correct gravity ready for charging. The elements should not be allowed to stand around and become dry, the maximum allowable time before replacing in the jar being from one hour to an hour and one-half.

Elements are inserted in their jars by first slightly warming the jar with a torch flame, then grasping the element so that it can be pinched together at the bottom and sliding it down into place so that the plate bottoms seat squarely on the sediment bridges. The element should make a snug fit in the jar because if it is loose the sediment bridges will wear through the plate edges and the bridges also will be quickly worn away. A snug fit can be secured by putting an additional insulator at one end of the element.

A repaired battery should be charged and tested before the cell covers are replaced and before the terminals and connectors are burned on. At the end of the charge the gravity is equalized in all of the cells and a discharge test should be given. If the behavior of all the cells is satisfactory in voltage, temperature, specific gravity and general ability, and if all of the terminals are found placed correctly as to polarity, the battery is then recharged and finally assembled with the cell covers and connectors. It is not safe to finish a repaired battery without a trial charge and discharge of this kind.

Sealing the Battery.

The sealing compound is melted in an iron kettle or old tea pot over a gas stove. With the kettle a large ladle is used, this ladle having a generous sized spout or else having a special valve opening through the bottom through which the compound can run.

The cells are made ready for sealing by putting the covers in place. If they are a snug fit they can be relieved by running a putty knife around their edges. If the covers are loose around the edges the space should be filled with hemp twine or tow so that the melted compound cannot run through into the acid space of the cell. All cover parts can be handled without danger of breakage if slightly warmed with the torch flame before they are put in place.

With the covers in place and the post locking devices and packing gaskets properly secured, all of the parts with which the compound comes in contact should be washed with kerosene. It is advisable to close the filler openings with wooden plugs while pouring the compound.

The compound in the melting kettle should be kept hot enough to flow evenly and to fill all spaces before setting, still it should not be hot enough to emit any quantity of smoke. The melted compound is poured slowly into all spaces to be filled, taking care that no air holes

are formed during the work. Best result will be obtained by moving the stream constantly around the space being filled so that the filling comes up evenly at all points. Because of the fact that compound shrinks considerably while cooling, an excess should always be used as this is easily trimmed away to make a good appearance.

If the battery is of the double cover type it is best to warm the top cover and to heat the top surface of the compound before this cover is put in place. After the top cover is placed it should be held down with a wood form having holes drilled for the terminal posts. This form is weighted with about 100 pounds and allowed to remain in place for 15 minutes, or until the compound has cooled.

Excess compound is removed with a hot putty knife or with a knife wet with kerosene. The battery is then washed with kerosene and thoroughly dried. The work can be tested by tilting the battery one way and another after the electrolyte is in the cells, when any leakage can be noticed, as the liquid comes around the edges of the covers and around the openings through which the posts pass. The battery is then painted with acid-proof asphaltum paint.

Lead Burning the Connectors.

Lead burning is the name given to the process of melting the lead and lead alloy parts of the batteries so that they flow together and make good electrical and mechanical joints. Lead burning is accomplished by the use of a flame produced by various gases, by the heat of electrical resistance of a carbon point, and by the use of hot soldering coppers in emergencies.

The type of equipment most generally used consists of a tank of compressed oxygen to which is fitted a regulating valve for reducing the gas pressure to the correct amount for use with the torch, also a safety valve attached to the illuminating gas pipe, a specially designed torch for producing the burning flame and the necessary tubing connections.

The safety valve is required in order that there may be no chance for the high pressure oxygen to back up into the illuminating gas mains, where the combination of the gases would produce a very explosive mixture.

The burning torch is usually equipped with two valves, one controlling the oxygen and the other the illuminating gas, and these valves are manipulated by the operator until the flame has the desired characteristics.

Another popular type of equipment consists of a mixture of hydrogen gas and compressed air. The outfit includes a generator for making the hydrogen, but this gas may be bought in compressed form in steel tanks or bottles, which proves much the best method of using it where the tanks can be obtained. The hydrogen generator comprises an elevated tank carrying the sulphuric acid and a lower tank in which is placed granulated zinc. The action of the acid with the zinc causes hydrogen to be generated and this gas is taken through a wash bottle to a tee connection, where it

is allowed to mix with the compressed air.

The tank usually has a capacity of from 20 to 40 gallons and is fitted with a hand or power operated compressor pump. From this tank a line of tubing leads to the mixing tee. The tee is fitted with two valves, one for hydrogen and the other for air. The torch consists of a handle and a burning tip.

Other gas outfits include those using a mixture of oxygen and acetylene controlled in practically the same manner as for oxy-acetylene welding, but with a special torch, also devices using mixtures of oxygen and hydrogen and others using illuminating gas and compressed air. The two equipments first described are those generally adopted because either one or the other may be easily secured and they are more satisfactory for this work than the remaining types.

When employing the electrical burning equipment for regular work in a battery station the electric outfit uses current from the lighting or power lines. If these lines carry alternating current, the burning equipment includes a transformer, which reduces the voltage and makes a heavier amperage available. If the supply is direct current, some method of reducing the voltage is employed, this usually taking the form of a rheostat.

One end of the burning circuit is attached to the body of the part being handled by means of a heavy clip through which current flows to the point of operation. The other end of the burning circuit consists of a handle carrying a rod or pencil of carbon, one end of which is brought to a fairly sharp point.

The circuit is completed and the heat produced by bringing the carbon point in contact with the part of the lead to be melted. The carbon immediately becomes white hot and the metal softens. The carbon is moved about and manipulated to flow the lead to the desired shape by always keeping the carbon barely in contact with the metal. The carbon should not be held far enough

from the lead to draw an arc while working. The degree of heat may be adjusted within narrow limits by increasing or decreasing the depth to which the carbon is dipped in the molten metal.

Electric burning can also be done by using the current from the battery being repaired or by using current from another storage battery. In this case it is only necessary to bring leads from the other battery or from the terminals of the battery being repaired. One lead is connected directly to the part being burned, while the other ends in a handle carrying the carbon pencil.

Unless the work cannot possibly be done with the gas flame or electric methods, a soldering iron should not be employed, because the joint cannot be so well made, nor can the appearance be made as good as with the former methods. If it is necessary to use the iron it should be heated red hot and all tinning thus burned away. No flux is to be used, but the iron can be applied directly to the points to be melted.

The preparation and handling of battery parts for this work calls for the employment of a few special tools, as follows:

Seven or eight-inch end-cutting nippers for trimming posts, lugs, connectors, etc.

Diagonal cutting pliers.

Triangular scraper for cleaning and finishing posts, connectors and other lead parts.

Stiff wire brush for cleaning parts before and after burning.

File brush or file card for cleaning files and also for cleaning lead parts.

Coarse 10-inch round file for use in connector holes.

Eight or 10-inch hack saw frame and blades for cutting plate lugs.

Wood mallet for driving parts into place.

Ball peen hammer for general utility.

Smoked or blue glasses for use of operator while burning.

For handling terminals and connectors, it will be necessary to have building forms or nipples having a tapered hole into which lead is melted to raise the post height. It is also advisable to provide tapered reamers for enlarging the openings in terminals and connectors. A post reducer can be conveniently used for trimming excess metal from terminal posts so that the parts will fit into place properly.

In burning plates into their straps to form groups or in making repairs, it will be necessary to supply a suitable rack with a set of spacers that will allow for the different distances between the plates of various batteries. A special hand punch may be secured which will punch out the holes in the plate straps when part of the old lug remains in place after the plate is broken or sawed off.

Burning Methods Simplified.

Battery repairers will generally find that after the parts being joined have been fused, additional metal will be required to finish the work and to give a good appearance. This additional metal is secured from small bars made from pure lead, if used on connectors and ter-

OKLAHOMA CITY SHOW.

THE Sixth Annual Oklahoma City Automobile Show, which will be held in the new \$300,000 Coliseum, begins on March 27 and extends through to April 1, as the show management feels that this is the most auspicious time to stage the event. Automobile concessions will rent for \$100 for the week of the show, and accessory booths will be \$75. E. T. Bell is secretary of the Oklahoma City Motor Car Dealers' Association, under whose direction the show will be held.

minals, or made from lead-antimony alloy if used for plate straps, plate lugs or other parts inside the cells.

If a gas flame is used for this operation, the gasses are adjusted so that the flame has two distinct parts, one being a ragged outside portion, while the other takes the form of a small inside cone or pencil of a different color. The hottest part of the flame is at the end of this inside cone and either way, toward the nozzle or toward the end of the outside flame, the heat becomes less intense. The tip of the inner cone is, therefore, used to melt the lead.

After the surfaces of the parts have been melted so that they flow together, the end of the burning bar is brought under the flame and sufficient metal is allowed to run from the bar to secure the desired appearance and a filled out joint. When melting lead parts, the flame should be brought against the metal momentarily, then taken away for an instant, because continued application of the intense heat would melt away portions of the lead that should be retained. No flux is used in this kind of work.

Every lead surface must be thoroughly cleaned with the scraper and a wire brush before burning is attempted, otherwise the parts cannot unite properly. During the burning operation, particles of dirt and scale will rise to the top of the puddle and these can be lifted out so that the finished surface will be smooth and unbroken.

After any joint has been burned, excess lead should be broken or cut away and the parts given a finished appearance with the scraper and a wire brush. Some joints can be rubbed into proper shape just before the lead solidifies, doing this in much the same way as a plumber wipes a joint.

If new plates are being used, the lugs will be found long enough and may even have to be cut off to make them of the same height as those on the old plates of the group.

If old plates are being used, it will, generally be necessary to build up the lugs to make them long enough. This is done by laying the plate flat on an iron or steel surface and with the surfaces well cleaned, placing two or three guide strips to make a form around the end of the lug. Lead is then melted into the space thus formed until it is as thick as the original part of the lug and of the desired length or height.

When the plates are made ready, the strap is prepared by cleaning it, making sure that the openings are large enough for the lugs, and by straightening it on a flat plate if it is bent out of shape even slightly.

The burning rack is then set up together with the spacers that accommodate the plates for the type of group being handled. This spacing can be determined from other groups of the same battery. The height of the spacer is also determined from other similar groups and the ends of the spacer are made of even height by raising and lowering the adjusting nuts.

The plate lugs are inserted through the holes in the strap and the strap is tapped

YPSILANTI SHOW.

YPSILANTI, the second city to hold a show in the circuit organized by the Michigan Automotive Trade Association, held a very successful exhibition, from a sales and attendance standpoint. The show was conducted by the Washtenaw County Automobile Dealers' Association, with O. C. Eckley of the Ypsilanti Chamber of Commerce, as manager. The show was held in one of the units of the Apex Motor Co.'s plant.

down solidly onto the top of the spacer. Guide straps are then placed around the edges of the strap so that these points will not melt through. The upper ends of the lugs are melted with the edges of the strap holes and sufficient lead added from the bar to make the top of the strap smooth and even. Finally, the edges of the strap is filed and the top brushed to make a neat appearance. Any lead that has run through the holes should be removed from underneath.

After the battery has been made ready to attach to the cell connectors and terminals, the first step is to test each cell with a voltmeter to make sure that the positive and negative terminal posts are in the correct position, according to the known design or according to the sketch made when the battery was taken apart.

The voltmeter will give a reading when the lead attached to its positive terminal is touched to the positive of the cell, while the other lead is on the opposite cell terminal. The vent plugs should then be removed and the accumulated gas blown from the cells. A shield of sheet metal should be laid over the filler openings between the opening and the parts to be burned. This shield can be moved about as the work progresses.

If the terminal posts are too large or too high they may be reduced with the post reducer or they may be either reduced or shortened with the end cutting nippers. If the posts are too low or too small, they may be raised or enlarged by using a post builder or nipple made from iron or aluminum and having its inside tapered to correspond with the desired post dimensions. This builder is placed over the post and the additional space filled in from the burning bar.

The connectors are prepared by straightening them if necessary, and by cleaning their ends with the file and wire brush. The openings through the connector ends are made of correct size for the terminal posts and the upper ends of these openings may be slightly tapered so that the melted lead will have an opening into which it can flow readily. The connectors are then driven

down over the posts with the wood mallet.

Care should be exercised to select the correct terminals according to their polarity, as positives and negatives are usually slightly different. Care should also be used to place the terminals in their correct position according to the battery design or according to the sketch made at the time of taking apart. The inside of the terminal holes and the outside of the terminal posts are then filed and brushed clean, after which the terminals are driven into place ready for burning.

When filling the openings above the terminal posts the edges of the hole and the top of the post should first be melted together. After these parts have joined, lead can be slowly added from the burning bar until the metal is brought flush with the top of the connector or terminal. The top of the joint is then trimmed evenly with the scraper and a drop of lead from the burning bar is placed in the center of the post and flowed evenly over the finished joint.

The polarity of the terminals is usually marked with "Pos" and "Neg" dies, or with plus and minus signs made with a die or with a blunt edge chisel. Letters or symbols are often placed on the terminals or on the cell connectors in order to show the kind of repair made, the date of the work and the station at which the work was done.

Lead terminal connections are attached to cable ends or else the end of the cable is burned into the terminal and, in turn, burned to the battery post. In some cases the end of the cable is inserted into an aluminum form to which the melted lead is added, while in other cases, the cable is placed in the opening of a lead connector. The cable insulation may be protected from the heat of the torch by wrapping a wet cloth about the cable. A neutral soldering fluid may be used in this work if required to make the copper and lead join properly.

Making Use of Scrap Lead.

By the use of proper moulds, most any battery station may turn most of the scrap lead parts into new parts with a saving of both time and expense. Every station should at least make its own burning bars. A tray-like mould having a number of grooves is used for making burning bars and the melted lead poured in slowly from one end and allowed to cool.

Other parts than can be made include taper terminals, terminal parts and plate straps. Terminal screws are formed by melting lead around the heads of brass cap screws in a special mould designed for the purpose. All mould interiors should be dusted with powdered chalk before the metal is poured into them.

In addition to the moulds, the equipment includes an iron melting pot into which can be placed old terminals, connectors and plate straps. Any brass, copper, steel or impurities will come to the top of the lead when it is melted over a gas flame and these can be skimmed off before the lead is used. A ladle for pouring the molten metal completes this part of the equipment.

Chassis Details of New Lexington

Fourteen New Features with Vast Number of Improvements in Former Units, Enhance Comfort, Performance and Endurance of Manufacturer's Newest Model.

ALTHOUGH the Lexington Motor Co. of Connersville, Ind., announced for the first time at the New York Automobile Show the newest and most remarkable member of its line, its five-passenger "Ultimate Model," not until recently did the company disclose in detail those finer points of construction that have made this one of the most talked-of models of the year in automobile circles. Greater com-

fort, with that quality that makes the purchase of any car a permanent investment, and performance standards that closely approach the larger and more costly cars, are the principal advancements aimed at in the development of this new chassis. The series "U" chassis is the ideal towards which Lexington and its great alliance of motor car parts plants have been working for years.

THIS is best evidenced by the fact that in this new chassis there are 14 entirely new features and a host of other units which have been improved to such an extent that the car is said to be almost revolutionary in the new standards of motor car quality it has fixed.

Among its new features may be listed three new frame units, consisting of a combination front cross member and front motor support, making the front end of the frame more rigid; an entirely new type of double triangular center cross member, 30 inches wide, preventing frame twisting, and a rear frame section which carries spring horns made deeper, with wide gussets to prevent side swaying.

To provide riding comfort, front springs are now 38 inches long by two inches wide, or four inches longer than on former models. Rear springs are 59 inches long by 2 1/4 inches wide, or three inches longer and 1/4 inch wider than on former models.

Other new spring features are boots to keep out water and preserve lubrication, enlargement of spring bolts to 3/4 of an inch in diameter, except the front end of rear springs, which are one inch in diameter, and round head bolts on front end of springs so that side play can be eliminated by tightening nuts. All spring bolts are fitted with force fad oilers. A new feature of the clutch is an annular type throw-out bearing in a stationary housing, with an oil reservoir.

Another new and exclusive feature is the two-way head lamp control, which is mounted on the steering column and operated by turning the horn button.

The Ansted engine, with which all Lexington models are now equipped, has been improved by three new features and several other refinements. For example, the water pump is driven by a "V" belt with automatic belt tightener integral with driven pulley. A spring in the fan mounting takes up slack in the belt when clamp screws are loosened.

To make the battery more accessible it has been located under the front floor board, which is divided on the center line of the car. Another new improvement is an automatic locking turnbuckle adjustment at the pedal making adjust-



Chassis of New Lexington "U" Model.

ment of the cable service brakes extremely simple. Front and rear bumpers, designed on scientific principles, are standard equipment.

Airless Auto Wheel

THE invention of the Airless Resilient Auto Wheel by Alfonso D'Errico is of interest to the automobile industry.

After years of study and experiment, Mr. D'Errico has perfected an apparatus which he says will entirely eliminate the inner tube now used in all pneumatic tires and which will give the long sought for resiliency to vehicles using solid tires.

By applying this new contrivance to the wheels of an automobile Mr. D'Errico states that one will be able to travel long distances without fear of punctures or blowouts, and that certain hardships and inconveniences of travel will be entirely overcome. He also says that time will be saved and many of the accidents which now are caused by tire trouble will be prevented. The new invention consists of rubber and metallic links, and is said to be so constructed as to produce a practical, durable and resilient wheel, economical in price and well within the reach of the average motorist who may desire to purchase it.

Mr. D'Errico has organized a company with offices at 27 School street, Boston, and states that the company has already started the manufacture of wheels at 234 Washington street, Somerville, Mass. The first set of wheels has been placed

on a Bay State car, and according to the driver of the vehicle has given good satisfaction. The car has been operated with the new wheels in exactly the same manner that it was with the original pneumatic tire equipment, it is stated, and regardless of road conditions has performed in pleasing manner.



Alfonso D'Errico, Inventor of Airless Resilient Auto Wheel.

(Continued from Page 9.)
EXHIBITORS AT BOSTON SHOW.

| Name | Address | Name | Address |
|---|---------|--|---------|
| Martin-Parry Corp., 142 St. Mary's St., Boston, Mass. | | Sills-Chevrolet Co., 110 Cummington St., Boston, Mass. | |
| Maxim Motor Co., Wareham St., Middleboro, Mass. | | Simplex Pneumatic Tire Co., 294 Washing. St., Boston, Mass. | |
| McQuay-Norris Mfg. Co., Cooper Ave., St. Louis, Mo. | | Bryant G. Smith & Sons Co., 661 Beacon St., Boston, Mass. | |
| Metal Stamping Co., 13th St., L. I., N. Y. | | Sparks-Withington Co., North St., Jackson, Mich. | |
| Middlesex Motor Car Co., 709 Beacon St., Boston, Mass. | | Spencer-Reed Co., Inc., 1265 Boylston St., Boston, Mass. | |
| Minard Co., Framingham, Mass. | | Splitdorf Electrical Co., 98 Warren St., Newark, N. J. | |
| Mitchell-Lucas Motor Co., 838 Comm. Ave., Brookline, Mass. | | Springfield Com. Body Co., 80 Charles River Rd., Cambridge. | |
| Montello, V., 68 Spring St., Medford, Mass. | | Standard Auto Gear Co., 251 Mass. Ave., Boston, Mass. | |
| Morse, Alfred Cutler, 705 Beacon St., Boston, Mass. | | Standard Oil Co. of N. Y., 50 Congress St., Boston, Mass. | |
| Motor Parts Co., 104 Brookline Ave., Boston, Mass. | | Standard Parts Co., 118 Walnut St., Cleveland, O. | |
| | | Standard Steel Motor Car Co., 52 Brookline Ave., Boston. | |
| National Motor Car Co., 983 Common. Ave., Boston, Mass. | | Standard Thermometer Co., 65 Shirley St., Boston, Mass. | |
| New England Velie Co., 842 Common. Ave., Boston, Mass. | | Stanley Co., Inc., John T., 626 W. 13th St., N. Y. C. | |
| New Era Spring & Specialty Co., 51 Cottage Grove, Grand Rapids, Mich. | | Stanley Motor Carriage Co., Hunt St., Newton, Mass. | |
| New York Lubricating Oil Co., 126 Mass. Ave., Boston, Mass. | | Sterling Motor Truck Co., 1031 Comm. Ave., Brighton, Mass. | |
| Noble Piano Co., 4841 Woodward Ave., Detroit, Mich. | | Stewart Automobile Corp., 603 Newbury St., Boston, Mass. | |
| No-Leak-O Piston Ring Co., 824 W. North Ave., Baltimore, Md. | | Sun Co., Finance Bldg., Philadelphia, Pa. | |
| Northway Motors Sales Co., 200 Brookline Ave., Boston, Mass. | | | |
| Noyes-Buick Co., 857 Commonwealth Ave., Boston, Mass. | | Texas Co., 201 Devonshire St., Boston, Mass. | |
| Nutter Electric Equipment Co., 169 Mass. Ave., Boston, Mass. | | Tonneau Shield Co., Inc., 47 W. 63rd St., N. Y. C. | |
| | | Travelers Insurance Co., 141 Milk St., Boston, Mass. | |
| O'Keefe, John F., 589 E. Seventh St., S. Boston, Mass. | | Trexler Co., 1418 Walnut St., Philadelphia, Pa. | |
| Packard Motor Car Co., 1089 Comm. Ave., Boston, Mass. | | | |
| Paige Detroit Co. of N. E., 532 Comm. Ave., Boston, Mass. | | Underhay Oil Co., 73 Batterymarch St., Boston, Mass. | |
| Pressure Proof Piston Ring Co., 107 Mass. Ave., Boston, Mass. | | The United States Air Com. Co., 316 Columbus Ave., Boston. | |
| Puritan Motors Corp., 1001 Comm. Ave., Boston, Mass. | | U. S. Light & Heat Corp., Niagara Falls, N. Y. | |
| | | Utica Compressor Co., Inc., 819 Hamilton St., Utica, N. Y. | |
| R. & V. Motors of N. E., 872 Comm. Ave., Boston, Mass. | | Utterback-Gleason Co., Inc., 870 Comm. Ave., Boston, Mass. | |
| Ramsey, Edward G., Douglas St., Uxbridge, Mass. | | | |
| Reed Motor Car Co., 961 Comm. Ave., Boston, Mass. | | Vacuum Oil Co., 61 Broadway, N. Y. C. | |
| Republic Truck Sales Corp., 983 Comm. Ave., Boston, Mass. | | Veeder Mfg. Co., Hartford, Conn. | |
| Richards-Wilcox Mfg. Co., 132 Pearl St., Boston, Mass. | | | |
| Rimco Lubricator Co., Inc., 739 Boylston St., Boston, Mass. | | Wachusett Motors, Inc., Fitchburg, Mass. | |
| Rockwell, Inc., C. P., 640 Comm. Ave., Boston, Mass. | | Walker Vehicle Co., 592 Comm. Ave., Boston, Mass. | |
| Romelfanger, N., 398 Newbury St., Boston, Mass. | | Weaver Mfg. Co., 2165 S. 9th St., Springfield, Ill. | |
| Ross Gloss Co., 424 Lexington St., Auburndale, Mass. | | Wells Motor Co., 842 Comm. Ave., Boston, Mass. | |
| Russell Mfg. Co., The, Middletown, Conn. | | Westinghouse Air Spring Co., 1105 Comm. Ave., Boston, Mass. | |
| | | White Co., 930 Comm. Ave., Boston, Mass. | |
| Safstrom Mfg. Co., 6706 S. Chicago Ave., Chicago, Ill. | | The White & Bagley Co., 100 Foster St., Worcester, Mass. | |
| Salman, John A., 51 Summer St., Boston, Mass. | | White & McAlister, 126 Mass. Ave., Boston, Mass. | |
| Sargent & Ham Co., 28 Scotia St., Boston, Mass. | | Whittredge Portable Steel Bldg. Co., 964 Broad St., W. Lynn. | |
| A. Schrader's Son, Inc., 470 Vanderbilt Ave., Brooklyn, N. Y. | | Wills Sainte Claire Co. of N. E., 834 Comm. Ave., Boston. | |
| Sewell Cushion Wheel Co., 584 Comm. Ave., Boston, Mass. | | Wilson Co., John V., 76 Brookline Ave., Boston, Mass. | |
| Shotwell Pump & Tank Co., 22 Parkman St., Boston, Mass. | | Wilson, K. R., 10-16 Lock St., Buffalo, N. Y. | |
| | | Wing, F. E., 1249 Boylston St., Boston, Mass. | |
| | | Winton Co., The, 894 Comm. Ave., Boston, Mass. | |
| | | Wire Wheel Corp. of Amer., 1700 Elmwood Ave., Buffalo, N. Y. | |

(Continued from Page 21.)

is immediately put back in the oven and reheated. This time it is not carried to quite such a high temperature and is removed from the furnace just after it has passed through the transformation stage (the stage where the maximum refinement and treatment of the crystal content takes place). It is then removed and quenched a second time. Common practise with gears used in the ordinary car or truck is to perform both of these functions in a single heat-treating operation. Naturally, the maximum of attainment cannot be secured. After the second heat treatment these gears show a tremendously high tensile strength, very much in excess of that which is required. Incidentally, though, they are inclined to be brittle hard—of a nature that would break with the slightest unusual shock or strain. In order to remedy this condition all gears are subjected to a tempering or drawing process which tends to partially draw the hardness and to incorporate excessive toughness. Although this slightly lowers the tensile strength, we find that the gears are still considerably stronger than necessary, allowing for a high factor of safety.

After tempering the shifter fork collar recess and spline grooves are ground so the gear may fit perfectly in the slid-

MEXICO SHOW APRIL 16.

THE Mexico automobile show will be held in Mexico City, April 16 to 23, inclusive. It is to be a pretentious affair and will be open to all dealers in the United States and to all makes of automobiles, trucks and tractors. Mexico has an unusually large amount of second-hand cars, which have hurt business to a great extent during the last year, but despite this condition Mexico City dealers seem confident that business will be reasonably good.

ing shaft and allow for perfect freedom of movement when shifting is necessary.

Triple Strength Attained.

Summing up the various stages or steps in the creation of this unit, it may be noticed that the gear receives in all four separate heat treatments and that, in the finished state, it is practically three times as strong as the original bar stock from which it was formed.

Steering knuckles and driving axle shafts are treated in the same exacting manner. Scores of other parts could be subjected to the same analization and would show equally interesting characteristics.

H. C. S. CUTS.

The H. C. S. Motor Car Company announces the following reduction taking effect March 4:

| | |
|---------------------------|--------|
| Touring | \$2400 |
| Roadster | 2400 |
| Coupe | 2850 |
| Sedan | 3150 |
| All Weather Touring..... | 2600 |
| All Weather Roadster..... | 2550 |

This is approximately \$500 to \$600 reduction from Aug. 1 prices.

Used Car Problem of Vital Interest

(*By SHERMAN L. SMITH, Advertising Manager, Linscott Motor Co., Boston.)

IT IS a known fact that a very large percentage of the new automobiles sold today are sold on the basis of an allowance made for used cars taken in trade. Those in the business also know—and those outside may easily assume—that the disposal of these used cars is becoming an increasingly important problem.

YET the real problem is not so much the sale of the used cars as it is the allowance of the proper amount of credit by the dealer taking them in. On the surface it would seem that this is of so vital importance to the dealer alone and that the owner who is trading for a new machine will find it to his advantage to seek out the dealer whose generosity, or lack of judgment, or something else, will cause him to make the largest possible allowance on the used car involved. The customer, however, is the most likely to suffer in such negotiations, after all, and the "something else" a dealer may sometimes have is responsible.

When a man who owns a machine enters the sales office of an automobile dealer for the purpose of negotiating a trade, he is likely to lay more stress on the sale of his own car to the dealer than on the value of the machine he is about to buy. This may be justifiable if the owner distrusts the dealers and looks upon the transaction as a battle of wits; but presumably, if he has selected this house as the place to trade, he has confidence in the fairness and honesty of the firm, and he would be likely to receive much more liberal treatment if he would, to a reasonable extent, place his case entirely in the dealer's hands.

Satisfied Customer an Asset.

An automobile concern which has been a long time in business and has built up a large organization and a good reputation is not going to let a customer be dissatisfied if it can be prevented; and the sales manager for such a firm will feel much greater responsibility in treating a customer liberally when he shows his faith in them than when he gets everything which he does get by reason of much haggling and discussion. It will pay automobile owners to remember this. They will be much better off if they handle their trading in this way.

The man who is sales manager for an automobile dealer is well acquainted with market conditions and a good judge of values; otherwise he would not be able to hold his position. His experience will tell him much better than the owner himself knows, the value of the used car. When he has appraised it in his own mind, if he is the right kind of sales manager, he will determine pretty accurately its market value and will be guid-

ed by that alone in making his allowance. There are many men in this position, however, who, after appraising the market value of a used car, will permit two other factors to influence their allowance—how badly they want to make the sale and how much of their profit on the new car they are in a position to sacrifice if they have to sell the used car at a loss.

Entitled to Just Profit.

Every legitimate dealer is entitled to a just profit on the sale of used cars; but many are satisfied if they can turn them over for exactly what they allow. The



Sherman L. Smith, Editor Linscott Reo-Gram and Advertising Manager Linscott Motor Co., Boston, Mass.

day is coming, it is inevitable, when every automobile owner who turns in his used car in trade for a new one will be charged a reasonable percentage as the dealer's selling expense and profit. It will be a uniform percentage, and every dealer will charge the same. But for the present the dealer has to be satisfied to make one profit on the sale of two machines, the new one and the used one, and sometimes on three, when a second used car is taken in trade for the one originally turned in. Human nature is pretty much the same in everyone, and even if a dealer is willing to sacrifice a part of his profit on a new car, the remaining profit, marking the limit to which his sacrifice will go, will be very nearly the same in every case. In other words, every dealer insists upon getting a reasonable profit out of the transaction. This means that when some dealer in particular is willing to make a much larger allowance on a car than are the others it may be taken for granted that his new car allows him an unusually large margin of profit, which he can cut deeply into and still not suffer—which is the same as saying it is greatly overpriced.

Beware High Allowances.

The logical conclusion to draw from this is that when one dealer outbids all others in his class the customer, instead of turning to him as the one most likely to look after his interests, should beware him as the one most likely to sell him a car which is not worth the price. The man who has made a careful analysis of the merits of a particular car and is decided that that and that only is the one he wants to buy, and who has confidence in the fairness of the dealer who sells it, stands a good chance of getting his money's worth. But the man who says, "They're all good," and proceeds to shop around to sell his used machine to the highest bidder is likely to keep on till he gets stuck, and the more he shops the worse he gets stuck.

The value of an automobile is in the machine, not in the selling price, and if a man buys a car priced at, say, \$2000 and gets an overallowance of \$250 on his old machine, he may be pretty confident that he is getting a car that ought to be priced at \$1750 or less, and whose resale value is likely to prove disproportionately small, if indeed it does not disappear altogether when he tries to turn in the machine.

The automobile buyer should not neglect the importance the used car problem has for him, for the solution of this problem lies in educating the buyers to its true significance. So long as a man thinks he is putting something over on the trade by trying to see who will make him the largest allowance, he is going to continue the practise; but when he comes to realize that the reverse is true, he is going to buy his car on the basis of comparative value with other new cars and trust the dealer to make him the maximum allowance that the market value of his used machine will permit.

•Linscott Reo-Gram.

NEW LEAD COATED BATTERY HANDLE.

The Mueller Electric Co., 2135-45 Fairmount road, Cleveland, O., has recently added to its line a new lead coated wire handle, which is known as the No. 110-A. This handle is provided with an offset at the top of the handle which allows a greater space between the handle and terminals of the battery. The drilling centers are 1½ inch, which is standard with most manufacturers, while the grip has sufficient room for four fingers. The lead coating is put on by a special process, which gives a smooth finish that is stated to resist acid better than ordinary lead plating.

Charles Wierenga is now the sole owner of the Topeka Motor Car Co., Topeka, Kan., his partner, M. A. Hogue, having moved to California.

TRADE OUTLET

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MANUFACTURERS OF

WELDING & CUTTING



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BOSTON

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Radio Receiving Sets
To listen in on musical concerts,
speeches, and sayings, buy a
NACO RADIO OUTFIT.
There are many different sets on the
market, but for quality, efficiency,
clearness and simplicity a NACO
Receiving Set predominates.

\$15

National Motor Accessories Corp.
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WANTED—High grade salesman to
call on the jobbers of the country with
a high grade line of All-Steel Bodies
for trucks and Ford roadsters. The N.
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Tire Chain. A fast seller. A big profit
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CO., 1212 H St., Washington, D. C.

THE CURTISS-WILLIS CO., Inc.
30 Church Street, New York
Telephone: Cortlandt 4338

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The Largest Dealers in Used and New
Tanks.

*At the prices we make we should sell a
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We are anxious to become so well
known that when a man thinks of
tanks he will automatically think of
Curtiss-Willis.

We are building and selling new tanks
of all kinds in every part of the country.

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POPE, PACKARDS, PIERCE, BUICK,
STEVENS-DURYEA, KNOX, OVER-
LAND, ETC.

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|--------------|------------|-----------------|-----------|
| Motors. | \$25.00 up | Presto Tanks. | \$4.50 up |
| Magnetos. | 4.00 up | New Spotlights. | 2.00 up |
| Carburetors. | 3.00 up | Generators. | 10.00 up |
| Rear Axles. | 15.00 up | Gears. | 1.00 up |
| Front Axles. | 5.00 up | Bearings. | 1.00 up |
| Cylinders. | 5.00 up | Radiators. | 10.00 up |

\$12 Diamond Bumpers.....\$5.50
Jobbers in Bankrupt Auto Supplies.

BRIGHTMAN AUTO EXCHANGE

321 Windsor Ave., Hartford, Conn.

Calendar of Conventions and Exhibitions

Feb. 11-18—Kansas City, Mo., Automobile Show, Kansas City Motor Car Dealers' Association, Overland Building; Manager, E. E. Peake.

Feb. 14-18—San Francisco, Cal., Sixth Pacific Automobile Show, Motor Car Dealers' Association of San Francisco, Exposition Auditorium; Passenger Cars, Trucks, Tractors and Accessories; G. A. Wahlgreen, Manager, 215 Humboldt Bank Building.

Feb. 12—Madison, Wis., Ninth Annual Show, Automobile Dealer Division, Association of Commerce; Passenger Cars, Trucks and Accessories; Don W. Mowry, Manager, Cartwell Building.

Feb. 14-16—Chicago, Ill., Convention, Illinois Retail Hardware Association, Hotel Sherman; Leon D. Nish, Secretary, Elgin, Ill.

Feb. 14-17—Philadelphia, Pa., 21st Annual Exhibit and Convention, Pennsylvania & Atlantic Seaboard Hardware Association, Inc., Commercial Museum; Automobile Accessories, Etc.; Sharon E. Jones, Secretary, 1314 Fulton Building, Pittsburgh.

Feb. 14-17—St. Paul, Minn., Convention, Minnesota Retail Hardware Association; H. O. Roberts, Secretary, 1030 Metropolitan Life Building, Minneapolis.

Feb. 14-18—Kalamazoo, Mich., Automobile Show, Kalamazoo Automobile Dealers' Association.

Feb. 17-28—Trenton, N. J., Automobile Show, Trenton Automobile Trade Association, Second Infantry Armory; Manager, Frederick Petry, Jr.

Feb. 18-25—Hartford, Conn., Automobile Show, Hartford Automobile Dealers' Association, State Armory; Manager, Arthur Fifoot.

Feb. 18-25—Albany, N. Y., Automobile Show, Automobile Dealers' Association,

State Armory.

Feb. 20-25—Bethlehem, Pa., Automobile and Accessory Show, Bethlehem Trade Association; Manager, J. L. Elliott.

Feb. 20-25—Grand Rapids, Mich., Automobile Show, Passenger Car Dealers' Association, Furniture Exhibition Building; Manager, M. D. Elgin.

March 11-18—Bronx, N. Y., Bronx County Automobile Show, Passenger Cars, Trucks and Accessories, 105th Field Artillery Armory, 166th Street and Franklin Avenue; Manager, H. G. Stiles, 2483 Tiebout Avenue, Bronx.

March 11-18—Newark, N. J., Automobile Show, Newark Automobile Dealers' Association.

March 11-18—Boston Show, Mechanics' Building.

March 13-18—Boston, Mass., Automobile Salon, Boston Automobile Dealers' Association, Inc., Copley Plaza Hotel; Manager, Chester I. Campbell.

March 13-18—Omaha, Neb., Automobile Show, Omaha Automobile Trade Association, Auditorium; Manager, A. B. Waugh.

March 15-18—Port Huron, Mich., Automobile Show, Port Huron Automobile Dealers' Association.

March 21-22—Ypsilanti, Mich., Automobile Show, Ypsilanti Automobile Dealers' Association.

March 23—Philadelphia, Pa., Sectional Meeting, Society of Automotive Engineers.

March 24—Detroit, Mich., Meeting, Society of Automotive Engineers.

March 24-25—Ann Arbor, Mich., Automobile Show, Ann Arbor Automobile Dealers' Association.

March 27-April 1—Oklahoma City, Okla., Sixth Annual Automobile Show, Coliseum, Oklahoma City Motor Car Dealers' Association; Manager, Edgar T. Bell.

March 28-31—Benton Harbor, Mich.,

Automobile Show, Benton Harbor Automobile Dealers' Association.

March 31—Chicago, Ill., Mid-West Meeting, Society of Automotive Engineers, "Various Commercial Fuels and Their Relative Characteristics."

April—Buffalo, N. Y., Second Annual Motors and Sportsmen's Show, Automobile Club of Buffalo; Manager, D. H. Lewis.

April 2-8—Battle Creek, Mich., Automobile Show, Battle Creek Automobile Dealers' Association.

April 27—Philadelphia, Pa., Sectional Meeting, Society of Automotive Engineers.

April 28—Detroit, Mich., Meeting, Society of Automotive Engineers.

May—Trenton, N. J., Annual Convention, New Jersey Automotive Trade Association; Secretary-Treasurer, H. S. Moore, Trenton.

May 1-15—Scheveningen, Netherlands, Second Annual Automobile Exhibit; Secretary, No. 185 Spui, The Hague.

May 16-19—Chattanooga, Tenn., Convention and Exhibition, Southeastern Hardware and Implement Association (Alabama, Florida, Georgia, Tennessee); Secretary, Walter Harlan, Jacksonville, Fla.

June 11-15—Milwaukee, Wis., International Convention of Associated Advertising Clubs of the World.

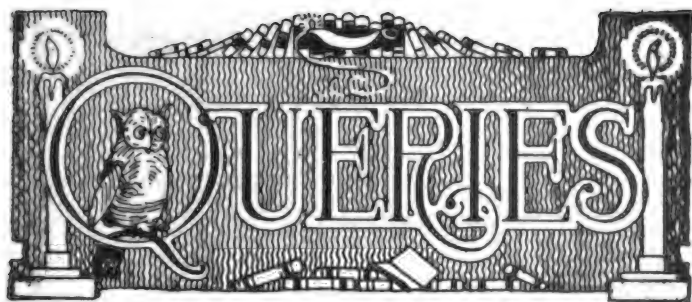
June 19-25—Colorado Springs, Col., Summer Meeting, Automotive Equipment Association.

September—Rio de Janeiro, Brazil, Automotive Exhibition in Connection with Brazilian Centenary.

Sept. 18-23—Rome, Italy, Second Annual Meeting, International Chamber of Commerce.

Nov. 13-18—Chicago, Ill., Annual Convention and Business Exhibit, Automotive Equipment Association, Coliseum.

(When Writing to Advertisers, Please Mention the Automobile Journal.)



CLEARANCE.

(S. A. T., Monson, Mass.)

I am overhauling my Reo 1918 six-cylinder car and I intend to take up on all bearings. I would like to know what clearance to allow on the main crank shaft and the connecting rod and wrist pin bearings. Also, I desire to rebush the connecting rods at the wrist pin ends. What kind of metal should I use and how much larger than the hole should they be to keep them from coming out?

In overhauling an automobile the clearance should be practically eliminated by drawing down on the various bearings you mention until the journals turn stiffly in the bearings. This may seem a dangerous procedure, but an automobile engine is subject to a series of blows under its own power and soon creates its own clearance. Care must be taken that the two bearing halves set firmly and solidly to each other when the bearing nuts are set up firm and the journal is touched.

It may be necessary to engage a tow in order to start the engine after reassembling, but put in plenty of oil and run slowly and for short intervals until it is worked in (which will take but a short time), then take the same care you would with a new engine for the first 500 miles and you will experience no trouble.

In rebushing the connecting rod to tin bronze makes a very good bushing. Turn it .0045 of an inch over size for a good drive, then ream out the hole after driving or pressing it in place. I would suggest that you press it in. This can be done very handily in the home shop by putting a pair of false jaws—preferably of brass or copper, on the vise. File the bushing on one end so it will start fairly in the hole to be rebushed, then put it in the vise and use the screw to do the pressing.

AMMETER GIVES TROUBLE.

(C. E. H., Harrisburg, Pa.)

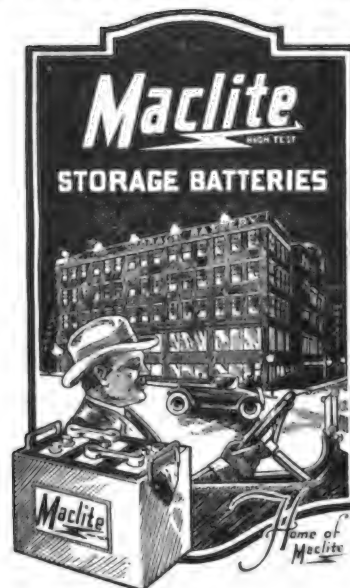
I am having considerable trouble as well as anxiety thrust upon me by the way the ammeter of my 1918 — model D touring car is acting. Sometimes it will work fine for a short time, then it will register right when the car is running and the battery is being charged, but when the car is stopped the engine and lights cut out, the ammeter continues to show a discharge. The car appears to run fine and a number of people have looked the wiring over and pronounced it all right. I would like to know if it will do any damage to run the car with the ammeter acting in this manner. In your opinion what is the trouble with the ammeter?

I should judge in your case the trouble is not with the ammeter at all. If the engine is running and the ammeter shows "charge," then the engine is stopped and the ammeter jumps over to "discharge," I would say the trouble was in the relay. To make sure disconnect the ammeter wires and note if the needle or pointer comes back to the center. If it does not the trouble is in the ammeter, but if it does the trouble is not with the ammeter, but is in the wiring or the relay.

The relay is supposed to break the circuit from the battery to the generator when the generator is not storing energy in the battery, but sometimes it happens that these points stick and the circuit is not broken.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

WINS IN ENDURANCE TEST BY LARGE MARGIN



DEALERS:

If there is not an MACLITE STORAGE BATTERY dealer in your territory, we have an interesting proposition to make you.

Write at once, or wire.

MACLITE STORAGE BATTERY CO.

62 STANHOPE STREET, BOSTON, MASS.
Factory and General Offices, MacLite Bldg.

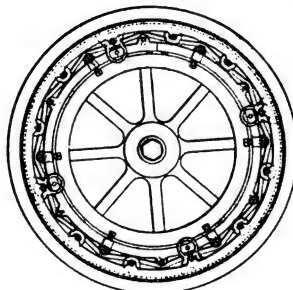
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- - TO-DAY - -

Shares of the **AIRLESS RESILIENT WHEEL AUTO COMPANY** cost \$10.00 each

They will increase in value with the increase in demand for the finished product.



For further information apply to authorized Agents or to the Company direct

Airless Resilient Wheel Auto Company

INCORPORATED UNDER THE LAWS OF MASSACHUSETTS

Main Office, 27 School Street, Rooms 510, 514 & 515 Tel. Main 3241 Boston, Mass.

RINGS NEED RENEWING.

(A. B. S., Holyoke, Mass.)

I am the owner of a Buick 1916 light Six. This car has been carefully used and works very well, but on low engine speed it seems to lack its former smooth running qualities and power. The valves have just been ground and set, the carburetor is properly set and the engine appears to get a good spark at all speeds. In your opinion what is the trouble and remedy?

Your query has eliminated ignition, carburetor and valve trouble. The car having been used a number of seasons leads me to believe the trouble undoubtedly lies in the loss of compression, due to leaky rings or cylinders being worn out of round. This may be determined by lifting off one of the cylinder blocks and examining the piston rings. If there are any that have black spaces on the surface that bears against the cylinder walls, you may be sure that ring needs renewing.

The trueness of the cylinder may be determined by the use of an inside micrometer. Measure the open end of the cylinder first and jot down the measurement, then take four or five other measurements in different places along the cylinder body to the closed end, jotting down the measurements as taken. Then try the cylinder 90 degrees from the first line of measurements in the same manner. The different readings of the micrometer will inform you of the condition of the cylinders. If they are not concentric to within .003 of an inch it will pay you to have them reground, new rings fitted and pistons if necessary. If the trouble appears to be entirely in the rings, a new set will undoubtedly remedy your trouble.

LUBRICATING OIL TEST.

(J. E. S., St. Paul, Minn.)

During the last three months I have been in the habit of putting kerosene in the cylinders of my car and leaving it stand over night on an average of once a week. The man I bought the car from told me this had been his method to keep

the cylinders and pistons clean. Last week I had the car taken to a garage to have the carburetor adjusted and while talking to the proprietor I asked him what he thought of this method. His opinion was that it was not good practise as the oil should be renewed at least once a month and perhaps more often.

I would like to know if there is any method I might use to test the oil in the crank case regularly so as to ascertain whether it should be renewed or not. I dislike very much to throw away perfectly good oil and still I want the motor to be properly lubricated. I also would like your opinion on the practise of putting kerosene in the cylinders.

There is a method you might use to determine the lubricating qualities of the oil in the crank case of your car, but it would require some special fittings. Not knowing the way in which your garage is fitted up for experimental work, I will explain two methods that may be used; one to determine the lubricating qualities and the other to find any change in the flash point.

If you have a small counter shaft in your garage and some means of rotating it, make two split bearings exactly alike to fit it, then cut two pieces from a board, having these as near alike as possible, that will serve to clamp the bearing halves together. Place in one end a through bolt and nut to be used in tightening on the bearings. Make the board clamps with a handle on them about one foot long and place on the end of each handle the same distance from the center of the bearing, a five-pound weight.

Place both of these arrangements on the shaft at least three feet apart, then take some of the oil from the crank case to lubricate one bearing and use new oil for the other, keeping both well supplied with each kind and keeping the tightening bolts as near as possible at the same tension, which can be ascertained by noting the angle each handle stands from the vertical when the shaft is being revolved. Rotate the shaft rapidly for 15 minutes and note the difference in temperature of the bearings, if the oil in the crank case has lost its lubricating power this method will show it.

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The other method that may be used is perhaps slightly technical and demands the aid of laboratory instruments or home made instruments as a substitute. Ascertain through the manufacturer or his agent the flash point or burning point of the oil you are using. Then the flash point of the oil in your crank case may be ascertained by the use of the oil flash point tester. If the flash point has been greatly lowered it shows that the gasoline or kerosene has mixed with the lubricating oil.

The practise of putting kerosene in the cylinders to remain over night is all right once in a while, but it is not a good regular practise as the kerosene will undoubtedly get down to the crank case by morning. It is a much better practise to put the kerosene in through the auxiliary air valve on the carburetor after each day's running.

This is easily done by speeding up the engine and (with the aid of a funnel or pipe) pouring the kerosene in until the engine starts to slow down, then allowing the engine to blow out the charge of kerosene and speed up once more. Repeat this operation three or four times and the engine will have cleared itself of practically all the carbon in the cylinders and on the pistons. This method also helps to cut any carbon that may have gathered on the valve stems.

BEARINGS OUT OF LINE.

(C. E. H., Denver, Col.)

I am the owner of a Ford car and I recently overhauled it completely, putting in new crank shaft connecting rod bearings. The bearings are all standard make and I scraped them to a perfect fit. The engine worked fine for the first 100 miles and then it started knocking so badly I had to take it down again.

All the bearings I had put in had worn loose and I had to take up on the whole of them. I have run the car about 75 miles and now it sounds as if the same thing has happened again. The engine also heats up excessively. Would you please inform me what is the trouble?

Undoubtedly the trouble is misalignment in the crankshaft bearings you recently installed. When installing these bearings besides working for a good fit you also must be certain the crank shaft is at right angles to the center line of the cylinders, when the work of scraping in the bearings has been completed. This may be ascertained by placing a parallel along the top of the crank case after the cylinders have been removed, being certain to remove any dirt or burrs in order to allow the parallel to rest firmly on the metal of the crank case.

Place a dial indicator on a surface gauge and adjust the surface gauge so the indicator touches the journal of the shaft at one end of the engine bed, then try it at the other end. Scrape the bearings until the shaft sets perfectly parallel with the machined surface of the crank case. If this work is properly done I feel certain you will experience no more trouble.

DRESSING FOR LEATHERETTE TOP.

(A. W., London, Can.)

I imagine the covering of my top is some sort of imitation leather, probably cloth covered with some sort of a mixture. It hasn't cracked yet, but appears to be about to do so. The condition gets worse in cold weather and sometimes I hardly dare to put it up or take it down. Would oiling help it? Please answer in Auto Journal.

A top dressing recommended for an imitation or leatherette top is composed of six parts spermaceti, 18 parts beeswax, five parts asphalt varnish, five parts black vine twig, two parts Prussian blue, one part nitro-benzol, one part powdered borax and 66 parts of oil of turpentine. The wax is melted and the borax added, after which the mixture is stirred until a jelly-like mass is obtained. In another pan the spermaceti is melted, and the varnish, which has been previously mixed with turpentine, is added and the mass well stirred as it is poured into the wax mixture in the first vessel. The color is the last ingredient to be added, having

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been previously rubbed smooth with a little of the mixture. Still another formula which is very popular is composed of the following ingredients:

| | |
|-------------------------------------|--------------|
| Ground ruby shellac | 2.25 parts. |
| Dark resin | .91 parts. |
| Sandarac | .115 parts. |
| Gum resin | .115 parts. |
| Aniline black (spirit soluble)..... | .115 parts. |
| Lamp black | .115 parts. |
| Wood alcohol | 22.50 parts. |

The first step in preparing this mixture is to dissolve the sandarac, the dark resin, the gum resin, and the shellac in the alcohol; next the aniline black is added and then the lamp black, which has been made into a paste. Either of these should answer your purpose.

RATTLING HOOD.

(M. McV., Lexington, Ky.)

Have an old car but very serviceable and hate to part with it. Has recently been overhauled, but the hood rattles worse now than it did before. Isn't there a simple way to fix this rattling hood so it won't rattle? Thanking you and trusting to see same in the Automobile Journal.

A hood that has a tendency to rattle with the vibration of the engine may be silenced by drilling a series of holes in the metal band on which the edge of the hood rests and lacing the holes with rawhide strips. This provides a silencer which prevents further rattles or squeaks.

DENTED TANK.

(G. B., Dallas, Texas.)

A customer brought in a car with a dented tank the other day which proved too much for our repair man. This car was brand new, and he will probably be given a new tank, but in case this happened again we should like to know what you recommend to fix the trouble.

A case similar to the one you mention happened to an owner with whom we are well acquainted. Consequently he decided that he would drive his car till the new tank arrived, with the understanding that the agent would fit the new tank as soon as he received it. After driving the car for some weeks, as the new tank did not seem to arrive, he decided to have the damaged tank repaired. One or two small leaks were present in the tank, and these were soldered, making the tank tight.

What gasoline was in the tank was withdrawn before soldering, the drain plug in the bottom and the cover on top of the tank were left off for a time to allow the gasoline in the tank to evaporate before soldering the leaks. This was done to prevent igniting the gas in the top of the tank and cause an explosion. This done, a force pump was procured of the type used to force water into steam boilers where pressure water is not available, and this pump was connected by a pipe with the drain-out opening in the bottom of the tank. The inlet pipe was connected at the opposite side of the pump with the source of water supply, which in this case happened to be a barrel of water. Or if force water is available the tank can be filled directly from the faucet of the force water system, provided the pressure supplied is strong enough. If the pressure is known to be low it may be connected to the pump and the required amount of pressure supplied to the tank.

The next step is to take a mallet, fitted with a soft end, either lead or wood, striking the tank while it is under pressure light, firm blows around the dent, which will cause it to be forced outward, until the tank assumes its normal shape. Dents of considerable size have been removed by this method and is worth using in emergencies. The principle, of course, is obvious.

About 40 pounds of pressure is required for removing the dent and the water is forced into the tank from the pump or pressure system till this pressure is reached. It might be well to fit a gauge on the pipe to gasoline tank to show this pressure, although with care in pumping this will not be necessary.

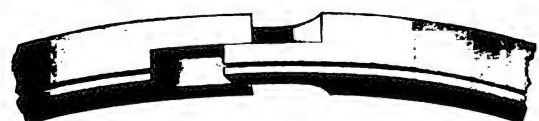
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You Can't Force Gas—Power—Oil Past the *Everyday* Joint— Because It's Locked!

Patented March 23, 1915



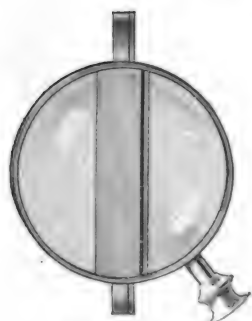
THE EVERYDAY MASTER LOCK JOINT locks the ring EDGEWISE, WIDTHWISE and LENGTHWISE—just like a solid ring. It will expand lengthwise to fit worn or uneven walls—but it still maintains its solid joint.



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MOTORED conditions have long demanded such a ring—and here it is. A composite of the advantages with none of the limitations of ordinary rings! *Everydays* give a greater degree of service—cost less to buy—require less time to install—and return you a larger profit per dollar of investment!

What one *Everyday* Advantage Means to You:

The Master Lock Joint

- eliminates joint leakage—you can't force oil—power—gas past it!
- allows a greater lengthwise expansion to fit worn or uneven walls—but still a solid lock! Fits a range of requirements that ordinary rings can't fit!
- reduces by *one-half* the necessity for oversize rings—entirely eliminates the need for .005 and numerous other oversizes. This means less stock to carry—less money invested—your turnover is quick, clean and free from loss.
- absolutely forces a more even wall pressure and tension under all compressions and temperatures.
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 JOURNAL**
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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUG. 24, 1912, OF

AUTOMOBILE JOURNAL,
PUBLISHED MONTHLY AT PAWTUCKET, R. I.
For April 1, 1922.

State of Rhode Island, County of Providence.

Before me, a Notary Public, in and for the state and county aforesaid, personally appeared William H. Black, who, having been duly sworn according to law, deposes and says that he is one of the owners of the AUTOMOBILE JOURNAL and that the following is to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the act of Aug. 24, 1912, embodied in section 448, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor and business manager are:

PUBLISHER, WM. H. & D. O. BLACK.....Providence, R. I.
EDITOR, S. G. SWIFT.....East Providence, R. I.
MANAGING EDITOR, S. G. SWIFT.....East Providence, R. I.
BUSINESS MANAGER, WM. H. BLACK.....Providence, R. I.

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3. That the known bondholders, mortgagees and other security holders owning or holding one per cent. or more of total amount of bonds, mortgages or other securities are:

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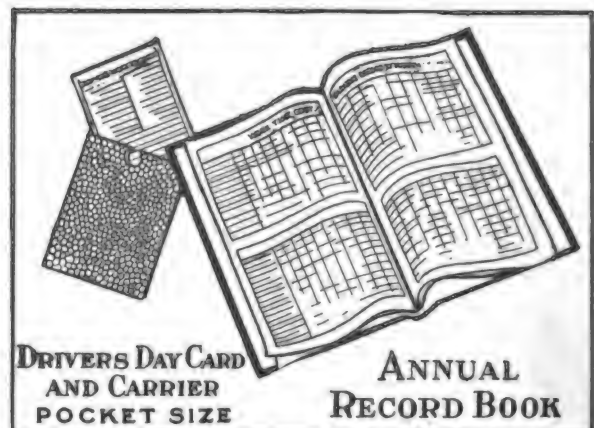
4. That the two paragraphs next above, giving the names of the owners, stockholders and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholders or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association or corporation has any interest direct or indirect in the said stock, bonds or other securities than as so stated by him.

(Signed) WILLIAM H. BLACK, Co-Partner.

Sworn to and subscribed before me this 13th day of April, 1922.
(Signed) THOMAS RESWICK, Notary Public.
[Seal] (My commission expires June 30, 1923.)

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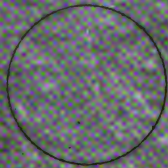
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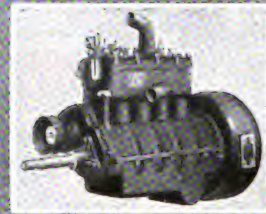
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THE AUTOMOBILE JOURNAL

VOL. LXIX.

PAWTUCKET, R. I., APRIL, 1922.

NO. 8.

Preparing the Car for the Summer Touring Season

*General Overhaul of the Most Important Units
Explained in Manner That Allows Owner
to do This Necessary Work*

USUALLY at the first indication of spring's arrival, the motorist, who has had his car in storage for the winter months without giving it any attention feels a strong—almost overwhelming desire to grasp the wheel and guide the speeding machine wherever fancy may dictate.

This desire at first is hardly strong enough to be so characterized, but, as the fine days begin to follow one another, it gets stronger as he visions wide expanses of open country and the smell of newly turned earth and, finally, along about the last of the second week in April, the motorist feels that life will not be worth living if he doesn't get out on to the highways by Sunday. So he telephones to the service station where his battery has been kept during the winter months and asks for the manager.

"Mr. Jones speaking," he says, when he finally gets the right connection. "About my battery; can you send it right up so I can get it installed first thing in the morning."

As this is about the five hundredth time the manager has listened to a similar request he is hardly surprised. "I don't believe so," he answers. "You see it needs a final charge to make it right and, also, there are about 150 customers ahead of you. Suppose I get

it ready for you in about a week?

But this won't do at all—and the motorist says so in very emphatic terms. "I want it tomorrow," he states. "Must have it. Can't wait any later than tomorrow night," and the much-harrassed station manager, realizing from past experience the futility of argument, makes a promise and trusts to luck to keep it.

Or, perhaps the motorist has not sent his battery to a service station, but instead has kept it in his own home, supplying it occasionally with distilled water. In his rush to get the car out, he takes his battery from the house, installs it, and tries the starting motor.

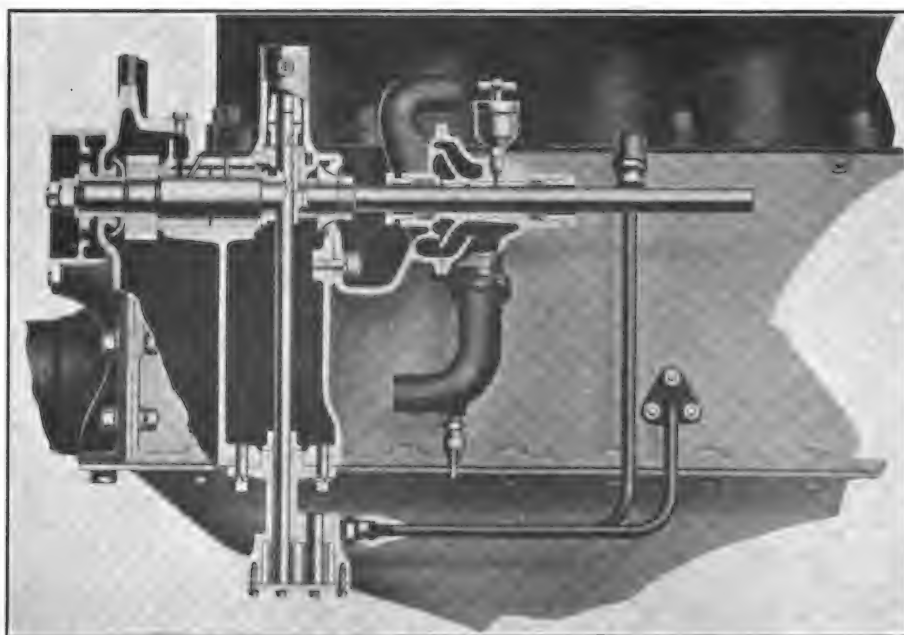
He's got to be rolling by Sunday—and he is, thanks to a lot of good luck. Then,

having realized his ambition, seen the country, smelled the fresh-turned earth and had a highly satisfying argument with the wife over whether it was a wasp or a hornet that backed up to Willie, that time they stopped for water down by the old mill stream—he returns home—and spends the next few months wondering what in time can all the "old boat,"—to make it run so poorly.

But it is his own fault because a machine that has been jacked up all winter should be carefully looked after in the spring before being operated under its own power. If a motorist wishes his car to be as dependable, efficient and enjoyable the second, third or fourth year as it was the first, he will give the car and engine the care and

consideration it surely deserves. The need for a definite schedule to follow in getting the car in readiness for the summer driving, has long been apparent. This reason has prompted the writing of the present article, the careful reading of which may be of pertinent interest to the car owner.

As a first step for putting the automobile in condition for driving, the wires should be removed from the spark plugs, a small tag being attached to each wire and marked from which plug it has been removed. Drain the crank case of all old oil by removing the



Many of the Engine's Auxiliaries Require Careful Attention After a Period of Idleness. Grease Cups Need to Be Refilled, Stuffing Boxes Repacked, Timing Gear Grease Replenished and Oiling System Cleaned.

drain plug located in the bottom of the case. If the garage in which the car is kept can be heated, it will cause the oil to flow more rapidly. While the oil is draining from the crank case the spark plugs should be removed and put in a can or vessel containing kerosene. The engine now can be easily turned by hand, as the compression is removed.

When all the oil appears to have been removed from the crank case, turn the engine over a few times, this will cause the oil pump to force any remaining oil from the lubrication system. Kerosene should be poured into the crank case and cylinders, through the breather tube and spark plug holes respectively, the engine being turned over in order that any of the old oil may be washed from the crank case and, if there has been any tendency for the oil to gum, the kerosene will remove it.

The kerosene should be drained from the crank case into a pail as it may be used in cleaning the different parts of the machine that have become coated with dirt and grease. Turn over the engine after the kerosene apparently has been all removed as the oil pump may drive more out of the system. After thoroughly draining the engine of the kerosene put in two quarts of good engine oil and allow the oil pump to force this through the system, draining it off afterward.

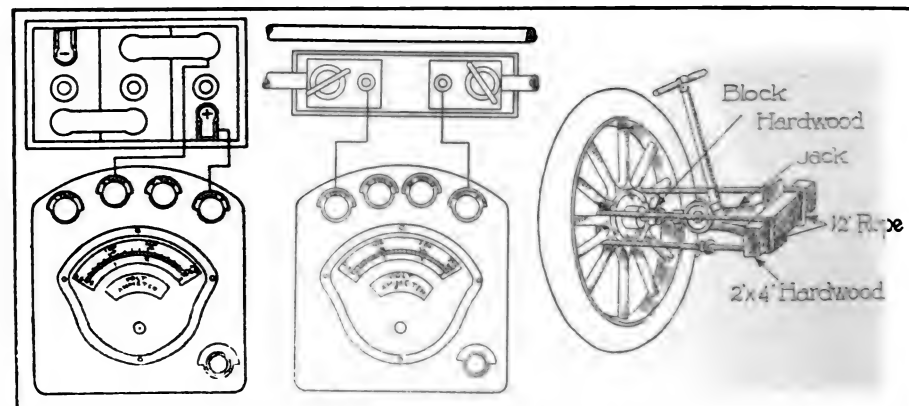
The grease in the timing gear case may never have been renewed since the car was first purchased and now is a good time to wash out the old lubricant and supply a good grade of new. Go over each nut and bolt carefully, not with a chisel and hammer, but with the proper size wrench to fit each one.

Loose or Broken Fan Belt.

Many times the belt driving the air circulating fan is broken or gone, and no

thought entertained of replacing it as the engine appears to run perfectly without it, or perhaps it is so loose it merely slips and slides over the pulley cones. This is a direct loss of power and the practise of discarding the fan belt is a case of courting disaster; it may not do any harm in the fall or spring, but the engine of the car at some time or other

will need all the air the fan can supply and it is for this reason that the manufacturer has determined a certain ratio between the speed of the engine and that of the fan. Thus if the belt is not kept in condition to revolve the fan without excessive slipping the engine will not get the proper amount of air for cooling and will overheat.



Left—Portable Volt-ammeter Testing Voltage of Single Cell in Storage Battery. Center—Meter with External Shunt Used to Ascertain Amperage of a Circuit. Right—Improved Method of Removing Wheel.

will need all the air the fan can supply and it is for this reason that the manufacturer has determined a certain ratio between the speed of the engine and that of the fan. Thus if the belt is not kept in condition to revolve the fan without excessive slipping the engine will not get the proper amount of air for cooling and will overheat.

Put on a new belt at this time, or if the one on the car needs more tension, loosen the clamping screw and adjust the belt crank so the belt will neither ride the pulley or be tight enough to cause a heavy strain on the bearings.

Leaky and Worn Hose Connections.

The hose connections between the en-

gine jackets and the radiator are subjected to many conditions not ideal or beneficial to the rubber used in their manufacture. The anti-freezing compounds and hot water are both detrimental to the lasting qualities of the rubber. Renew any connection to the radiator that is out of shape, cracked or possibly leaky. Many instances have oc-

curred where the use of a buckled or partially closed piece of hose has caused a great amount of trouble to the cooling system before being finally removed.

By writing to this magazine one may find the exact size and length hose required for any make and model of car. To install the hose one merely loosens the radiator securing bolts. Perhaps when last the motorist drove the car there was a water drip some place between the outlet or inlet hose connections and the radiator. This condition may be remedied by tightening up on the spring ring clamp. A leak in the cooling system not only looks bad and causes frequent refilling—it results in real damage many times because the constantly dripping water corrodes the iron and steel of the car.

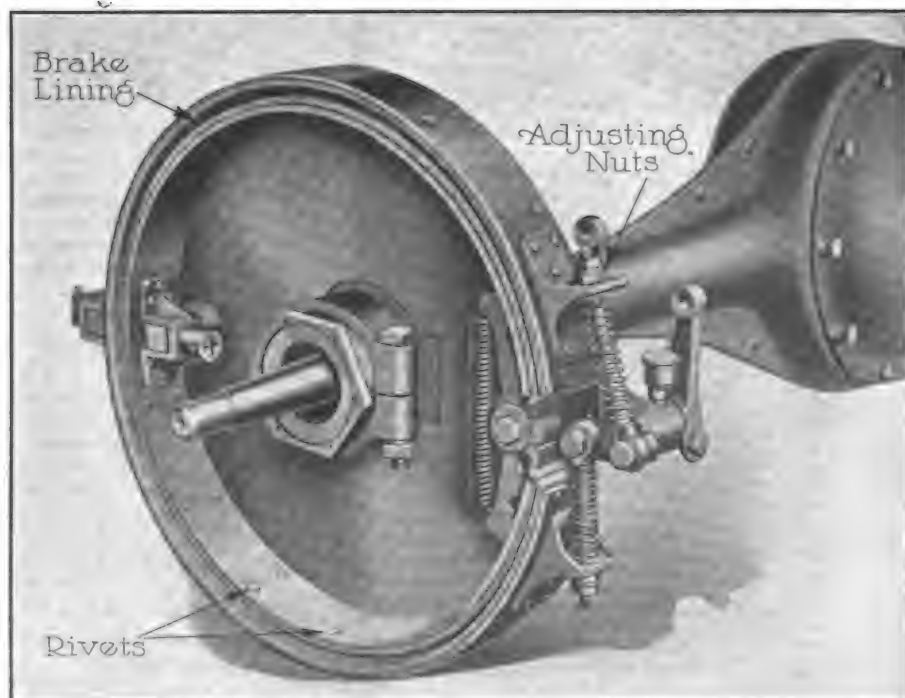
Clean out the air passages of the radiator of all grease, dirt, leaves and insects, using a small wire in order that the cooling efficiency of the radiator may not be impaired. Do not use oil or grease when cleaning a radiator as it has a tendency to catch and hold all dirt and dust and also decreases the radiating qualities of the metal. Fill the radiator with good fresh warm water, leaving the petcocks open until sure that the system is washed out thoroughly and no air pockets remain in the jackets or radiator.

Pleasure Afforded by Clean Motor.

It very often has been said, "The appearance of the engine reflects the character of the owner," this in many cases is very true. Careless and indifferent nature is reflected in a dirty, greasy and untidy engine, while a man of proud and systematic nature will invariably have a clean and well kept engine in his car.

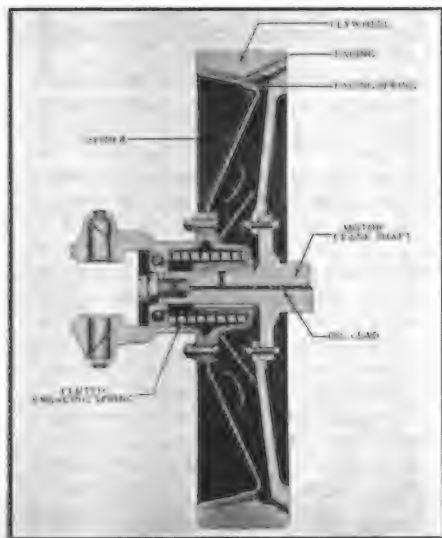
The average motorist might ask, "What difference does this make as long as the engine runs properly?"

The answer comes unhesitatingly from any good repairman, "It means the difference of a real good repair and a passable one in case the car ever needs the services of a repairman who is a mechanic."



Rear Wheel Removed, Allowing Free Access to Both External and Internal Brake Bands. Brake Lining Must Cling Closely and Evenly to the Band with Rivet Heads Counter-Sunk Below Brake Lining Surface.

To cite a specific example, a car with a dirty engine is driven to a public garage to have a repair done on the engine. The mechanic starts on that repair with a feeling of repugnance and disinterest that will show in the workmanship of the repair and the length of time taken to complete it. That same mechanic will approach a clean, well kept motor with a desire to do a dandy repair on such a



Clutch Performance Is Enhanced by Application of Nents-Foot Oil.

piece of mechanical beauty and quite naturally the very attitude of the repairman saves the owner a varying amount of money.

Clean the motor thoroughly, using the kerosene to cut any grease or dirt infested corners. On many engines the circulating pump shaft always looks dirty and black; this shaft can be brightened with emery cloth and rubbed down with machine oil.

If the stuffing box shows it has been leaking and the nut has been tightened to the end of the thread, do not take a large wrench in an endeavor to turn it more. Take the nut off the stuffing box and put in new packing that has been thoroughly soaked in graphite and oil.

Care to Be Used in Oiling.

It is mighty poor practise to use a cheap or inferior grade of oil. Obtain the right grade and the best possible for the engine. Fill the crank case to the level authorized by the manufacturer, but do not try to put in enough at one filling to last all season. It is better policy to try and keep the oil level as near constant as possible, this will prevent the tendency toward oil pumping by the pistons. When the crank case has been filled to the proper level put about two tablespoons of cylinder oil in each cylinder, this will help to seal the rings after having been washed clean by the kerosene.

The spark plugs may now be thoroughly cleaned and dried, a small quantity of vaseline spread on the threads, and then screwed into the cylinders, attaching the proper wire to each one. Whenever the spark plugs are screwed into the cylinder or a nut screwed on any thread it should always be lubricated, as this greatly re-

duces the possibility of stripping the threads.

Take Off Grease Cups.

Take off the grease cups and before refilling them try screwing them down in order to determine if they will travel the full length of the thread, as the chances are greatly in favor of the threads being rolled over, or in some other manner damaged to such an extent that the cup is prevented from more than starting on the thread.

Do not leave grease cups in this condition as the machine to which they are attached cannot be lubricated properly unless the cups can be used to force the grease into the bearings. Take the cup and its base off if necessary and if a die of the proper size and thread is not available the thread can often be cleaned out by the use of a knife edge file. If any of the cups are missing procure new ones before taking the car from the garage for by operating the car with the cups off, a direct lead is left open to the bearing that will catch any dirt or grit, grinding the bearings and journals of the machine in such a way as to ruin them.

A small hand oiler should be kept in the car at all times and used to oil all small bearings such as those on the starting motor and generator. The careful oiling of these units will save the motorist much trouble as an excess of oil destroys insulation on the windings and commutators, making short circuits which destroy the electro magnetic field, or, the insulation which keeps the serations from each other.

Each time the commutator appears dirty or discolored it should be cleaned and fine sand-papered if necessary after the battery has been installed. Use a small wooden strip to apply pressure to the sand-paper. Try the brushes in their holders in order to ascertain if any are stuck or tight. The brushes should move easily against the pressure of the spring's tension.

Care of Clutch.

In the majority of cars the clutch gives no trouble and for this reason receives little attention. A clutch may transmit the power of the engine to the driving wheels of the car, but still be operating improperly, causing high fuel consump-

tion or severe strains to the entire mechanism.

If a clutch is constantly slipping it not only wastes the driving power furnished by the engine but also damages itself by burning up the friction surface. On the other hand, if it takes hold of the load savagely it causes a severe shock to the engine.

Clutches of the cone type should be given an application of neats foot or castor oil at the spring tuning-up. This may be done by depressing the clutch foot pedal as far as possible and applying the oil to that section of the cone easily accessible, then turning the clutch until another section of the cone can be reached. In case the clutch had given trouble by slipping the past season a tightening of the tension spring will remedy this defect. Transmission grease or oil should be renewed and the grease washed out.

The old grease should be caught in a pail or bucket in order that it may be thoroughly examined for signs of chips from the gears; if this is conscientiously done the condition of the gears can always be ascertained.

Thickest Oil Not Best.

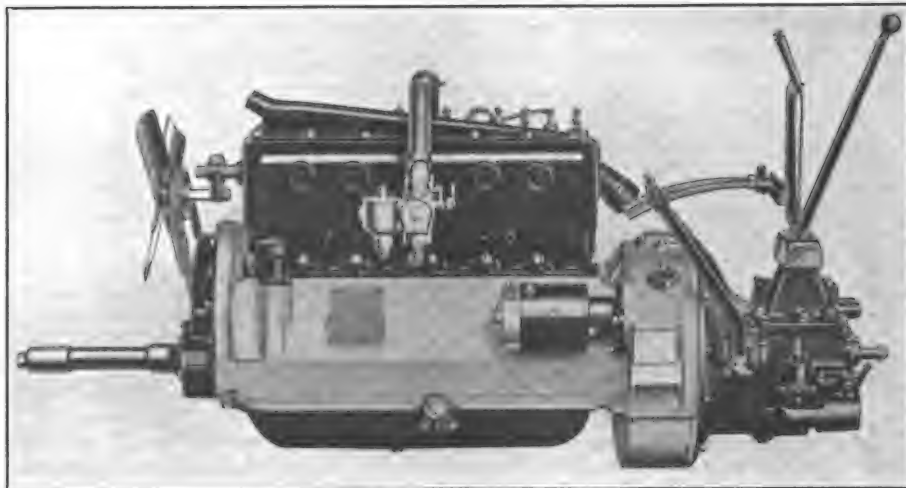
In refilling the transmission case it is well to remember that the thickest oil or grease is not always the ideal lubricant for the transmission gears. A heavy grease often generates excess heat and loses its lubricating qualities when a comparatively low temperature has been reached, while a medium grade oil or grease will stand a higher temperature and still retain its ability to lubricate.

Care of Universal Joints.

The universal joints may need to be repacked, if covered by leather boots the condition of the coverings should be ascertained and new ones placed over the joints if necessary. A careful examination should be made of all bolts and connections by getting under the car to the rear axle and trying all grease cups, bolts and nuts and stav rods encountered.

The differential should be gone over as carefully as the transmission and refilled with a good grade of fresh lubricant.

It is good practice to determine the condition of the brakes at this time and to carefully consider the advisability of relining them. If the owner wishes to



The Well Kept Engine Is Truly a Thing of Beauty. Graceful Lines and Compact Design Are Accentuated by Cleanliness. Fan Belt Tension Should Be Tested Occasionally and Adjustments Made if Necessary.

attempt this repair himself it can be performed easily with the aid of a wheel puller to remove the rear wheels. Care should be exercised when riveting the new lining to the band that no rivet heads extend beyond the circumference of the brake band.

Should any of the adjusting nuts be burred up or otherwise damaged causing them to work stiffly on the thread, time and trouble will be saved by using a tap on the nut or a die on the thread. When adjusting the bands make certain that they do not drag when the foot or hand lever is not depressed as this is a frequent cause for loss of power.

Repack Wheel Caps.

Wheel caps should be removed and packed with fresh grease. These caps are usually made of a composition and the threads are easily stripped. They should be screwed on the thread by hand as far as possible before a wrench is used. When tightening with the wrench only sufficient force should be applied to keep the cap from working loose from the wheel.

While the car is on the jacks the springs may be given a good oiling, separating each leaf and applying the lubricant in a thorough manner making cer-

tain that one spring is entirely finished before starting on another one. A car that has its springs oiled properly will repay the owner in easy riding qualities, for the time spent in caring for these vital units of construction. All the body bolts should be tried for tightness, these being responsible in many instances for elusive body squeaks.

Installing Battery.

The battery may now be installed after trying the solution and cleaning the connectors thoroughly with a mild solution of water and soda. In connecting the wires to the battery care must be exercised to connect the proper wire to each connector, if this is not done the polarity or direction of flow of the current, will be reversed and the wires must be changed immediately to remedy this condition.

If the owner has a volt-ammeter in his repair kit and understands how to use this delicate electrical instrument, the wiring system may be carefully checked up and also the amount of electrical power consumed by each unit ascertained.

Try Gasoline Line.

It is good practice to try the gasoline line before filling the tank with fuel. The union at the carburetor should be

broken, and by using the tire inflating pump, air can be forced through the line to the tank causing the ejection of any dirt or sediment that may have settled in the line. The tank may then be filled with gasoline and the jacks removed from the car.

The level of the oil in the crank case should be watched when the engine is being warmed up as the circulation through the system may lower the level considerably, necessitating the addition of more oil.

The composition of the tires is such that the subjection to the air and changes of temperature have a deteriorating effect on them. While stored away for the winter months they naturally lose some of the resilient qualities they possessed when last used. For this reason it is not a good policy to inflate the tires to their full capacity the first time the car is used, but instead to wait until the car has travelled 50 or 60 miles before bringing the pressure up to normal. This to some extent will help to decrease the possibilities of early blow-out.

The average medium price automobile should stand up and give good service for several years—it will, too, provided it gets proper care.

EXEMPLIFIES COACH BUILDERS' ART

THE most apparent new features of the Maibohm Sedan are the pronounced changes in body design. New and striking lines give a long and low appearance to the car. A different arrangement of windows gives a greater area of glass, and makes the car a veritable sun parlor on wheels. Wide sport type fenders with flapping canvas guards and solid aluminum steps securely bolted to the frame are other features which signal out the car, and to this must be added the flare created by the use of disc steel wheels, heavy nickel plated radiator, headlights and the two square coach type lamps on the sides.

THE interior of this model does full credit to the 33-year coach working experience of the Maibohm. The hand-painted outside finishes are royal blue and black, and Burgundy wine and black, and the interiors match. Only the highest grade broadcloth is used for the upholstery. It is furnished in blue for the royal blue finish, and in a rich but subdued wine color for the burgundy exterior.

Although low-looking from without, this sedan surprises in its generous room within. Five are seated with ease in the unusually roomy interior. The rear seat is 47 inches wide by 22 inches deep, and the front seat 41 inches wide and 21 inches deep. Marshall type cushion

springs support the seats and seat backs. From the dash to the back of front seat there is 49 inches of space, and the same amount from the rear seat back to the front seat.

This Maibohm Sedan Shows Pronounced Changes in Body Design and Better Window Arrangement.



The large heavy glass windows are fitted with roller curtains of silk, in shades that match the upholstery and finish. The door windows are operated by a single throw lever.

FIRST AID FOR MAGNETO.

Usually you are told when you ask someone how to fix a magneto not to monkey with it. In spite of this, there are little things about magnetos that can be easily fixed and it pays to know what they are. Some of the common troubles of the magneto and their remedies are given below:

1. Dirty interrupter points. These are especially noticeable by the way they are when the magneto is running. Usually all that is necessary is to wipe them off and file them down true with a fine file. The contact surfaces should meet squarely.

2. Failure of contact points to separate. In most magnetos the interrupter mechanism consists of a steel cam against which a fiber block strikes. The fiber block may wear away, thus leaving the breaker points in contact. Usually

the adjustment of the contact screws will fix this, or it may be necessary to put in a new part. Look also to the spring to see that it has not lost its elasticity.

3. Loss of magnetism in the magnets. This can generally be detected easily by the lack of resistance when the armature is turned by hand. The remagnetizing is a job for the service station, since the average person does not have the necessary equipment.

4. Short circuited windings. Sometimes due to the clogging of the safety spark gap. The current may jump from one winding to another, puncturing the insulation in between. The magneto may still spark with a short, weak spark. Here again the only remedy is rewinding.

5. Short circuited condenser. The purpose of the condenser is to prevent arcing between the breaker points. When the insulation of the condenser is punctured—get a new one.

"Repair It Now"

*While Shops Are Able to Give Proper Service—
Waiting May Mean Hasty Job That Will
Not Satisfy Particular Owner*

FOR years automobile repairmen and accessory dealers have seen business slow down during the winter and early spring months. But this year a concerted movement is taking place to induce motorists to "Repair it now."

MOTORISTS, too, are seeing that the policy of neglecting their cars through the winter months and postponing needed repairs is a short-sighted one. In the past it has seemed as if on the same morning in late spring nearly every motorist wakes up with the conviction that he'd better have his car repaired. They all tear off to repairman or accessory dealer, clamor for quick service, swamp the shops with work and, as a consequence, get just what they deserve—work that isn't and can't be thorough.

All over the country repairmen and accessory dealers are telling their customers by word of mouth, by mail and by published advertising to "repair it now." "Repair it now, while you can get prompt, thorough service—while the shops are able to handle your work the way it should be handled—and at less expense to you."

Motorists who are wisely heeding these suggestions are going to have their cars all ready to run when lovely nature beckons and the balmy breezes tell of wonderful days to come. The wise motorists are coming early to avoid the rush.

It is rumored that many cities did have "repair it now" parades on March 30. These parades should wake people up

to the facts when they see the novel stunts that will point out lessons in motoring preparedness.

Even in Southern California, where winter never comes, there is need for just such a spontaneous movement. Summer trips will be next in order and it's a lot better to be ready beforehand with needed repairs all done than to wait until it's

too late and then have to postpone a trip.

"Repair it now," is the slogan with which repairman and accessory dealers expect to wake up motorists to the wisdom of having their cars repaired before the late spring rush.

One repairman with a splendidly equipped shop says, "Right now I can give my customers thorough service without delays; overhauling, cylinder grinding, piston replacement, renewal of parts—all these can be done properly now, because my shop isn't jammed with work. I can satisfy my customers now, but a few weeks later it won't be so easy to do such good work, with everybody clamoring for immediate attention."

"I certainly am strong for this 'repair it now' movement that is starting up all over the country. It will make my business better and more uniform and it will benefit my customers."

Statistics show so many more cars in use that if they all follow the usual custom of jamming the repair shops with rush work it will probably take three weeks to get a spark plug cleaned.

The motorist who habitually puts off needed repairs until just before he is ready to start the first trip in the spring had better watch his step this year.

"Repair it now" is the slogan that repairmen and accessory dealers are impressing on motorists all over the country. "Repair it now," is a mighty wise thing to do, for now you can get thorough, prompt service. Three weeks from now you'll have to take your turn in line. Rush work is seldom satisfactory and cautious motorists aren't taking any chances on delays or poor workmanship.

REPAIR IT NOW!

Because:

1. Repair parts are easy to get now.
2. Repair men have the time to give you thorough service now.
3. In a short time everyone will wake up to the fact that repairs are needed.
4. The shops will be jammed.
5. Work will be rushed through hurriedly.
6. Repair parts will be harder to get.
7. Work that is hurriedly done cannot be as satisfactory as thorough work, and eventually costs more.
8. Delays on account of shortage of materials, rush work and unsatisfactory workmanship may be avoided.

PREDICTION that the Gray car would open up a new field to the automobile trade was apparently well-founded, as the corporation has been flooded with applications from dealers all over the world. The entire output for 1922 was sold even before the Gray caused such a sensation at the various automobile shows. Since that time, however, officials state that applications for 10 times this year's production have been received.

CONTRACTS for raw material have been placed covering the entire season's production, and the manufacture of the various units is now well under way. It is expected that the first shipments will leave the factory in May.

Gray Sells Output

The Gray car is said to embody all of the quality features which have hitherto

According to Reports from Factory Headquarters the Gray Car Is Having an Unprecedented Sale.



been found only in much more expensive automobiles. Every driving convenience now demanded by the motor wise pub-

lic, including self-starter, sliding gear transmission, oil cushioned disc clutch, acceleration pedal and demountable rims have been added.

The smooth, powerful four-cylinder motor, built in the Gray shops, embodies many good features.

AUTOMOBILES INCREASE 1,000,000

WITH returns received from all states, the Bureau of Public Roads of the United States Department of Agriculture reports that the motor vehicle registration for the year 1921 totaled 10,448,632. This represents an increase of more than 1,000,000 over the 1920 figures, or a number equal to the total number at the beginning of 1913.

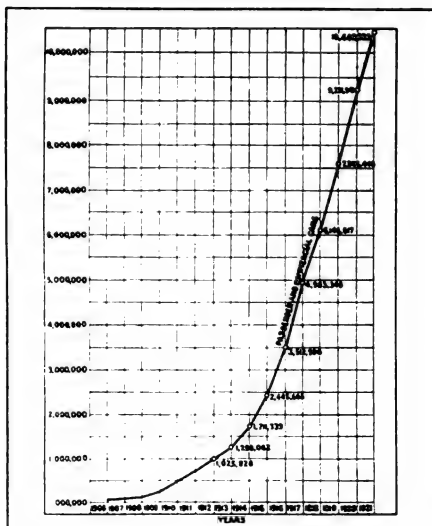
THE greatest increases in registration were in industrial sections, the agricultural sections in general showing a smaller amount of increase. No state reported a registration less than the 1920 figures. The total amount collected as fees of various kinds amounted to \$122,478,854.

It has been expected that the registrations this year would show a greater falling off in the rate of increase than the figures reported show. The increase this year continues approximately the same average rate that has been maintained for the last seven years and shows no

indication of the near approach of a condition of saturation in the supply of motor vehicles.

With more than 10,000,000 vehicles in use and the owners demanding im-

REGISTRATION OF CARS AND TRUCKS 1906-21.



proved roads over which to operate them, the question arises as to how long the country will have to wait for a connected system of highways covering the whole United States, say officials of the bureau.

The recent Federal Highway Act provided for the construction of a connected system of highways consisting of not more than seven per cent. of the roads in each state and made an initial appropriation of \$75,000,000 to be used in conjunction with state funds. The system to be built is now being outlined and it will comprise about 180,000 miles of road, included in which there will be about 60,000 miles that are already completed.

With an annual programme based on a Federal appropriation of \$75,000,000, and assuming that the states will continue to match the Federal funds in the same ratio as heretofore and that the average costs of the roads built will be \$20,000 a mile, officials say it will take 15 years to complete the proposed system. If the Federal appropriations are made at the rate of \$100,000,000 a year the system can be completed in 10 years, and if only \$50,000,000 is appropriated annually it will take 20 years to build it. The question is how long can we wait.

BAY STATE A QUALITY CAR

THE Bay State closed car, manufactured by R. H. Long Co., Framingham, Mass., is a quality car that is worthy a place in the list of fine cars manufactured in New England. The coach work is superior in design and

and a combined inlet and exhaust manifold, utilizing the heat of the exhaust gases to obtain the ideal temperature for the preparation of low-grade fuels for consumption.

Lubrication—Forced feed to crank-

mounted on ball bearings.

Brakes—Two sets on rear wheels, 16-inch diameter drum.

Frame—Seven-inch channel with wide flanges top and bottom. Cross tube at front end. Four cross members with gussets making a very rigid construction.

Steering Gear—Irreversible worm and full gear type steering arm of special steel heat treated.

Wheels—Best grade hickory, artillery type, 12 spokes front and rear.

Tires—32 by four cord tires, straight side.

Springs—Semi-elliptic front and rear, 40-inch front, 58-inch rear.

Instrument Board—Circassian walnut veneer with aluminum moulding. Black-faced instruments with nickel flanges. These include Waltham eight-day clock, speedometer, oil pressure gauge, ammeter, combination lighting and ignition switch with lock.

Equipment—Klaxon horn, extra rim with lock, tool kit, jack, pump, motor, windshield cleaner and sun visor.

Wheelbase—121 inches.

Car Weight—Sedan (shipping), 3200 pounds; coupe (shipping), 3000 pounds.

SHIPMENTS 150 PER CENT. ABOVE LAST YEAR.

Carload shipments for automobiles at the beginning of 1922 showed a 150 per cent. gain over a year ago. Reports of sales conditions from all over the country show improvement.



Here's a Real
Automobile That
Massachusetts
May Well Be
Proud of. It Is
Built in
Framingham.

finish, while a glance at the appended specifications will convince the prospective purchaser of the mechanical qualities of the vehicle.

Complete Specifications of "Bay State."

Engine—Six-cylinder Continental 7 R Red Seal 3¼-inch bore by 4½-inch stroke. Cylinders cast in block with detachable head. Aluminum crank case.

Horsepower—N. A. C. C. rating 25.35; actual 55 B. H. P. at 2600 revolutions per minute.

Crankshaft—Four bearing, 2¼ inches diameter, perfectly balanced and free from vibration at all speeds.

Carburetion—Stromberg carburetor

shaft main bearings and crank pin bearings. Oil spray lubricates the piston pin bearings, cylinder walls and shaft bearings.

Cooling—Centrifugal water pump, cellular type radiator with large cooling surface. Syphon thermostat keeps water temperature in cylinder jackets at a uniform temperature and thereby improves efficiency of engine.

Gasoline Supply—Stewart-Warner vacuum system.

Rear Axle—One-piece pressed steel housing. Spiral bevel driving gears of alloy steel. Differential and pinion shaft mounted on roller bearings. Rear wheels

Star Follows Conventional Lines

NEARLY 27,000 people attended the first showing of the new Star car, W. C. Durant's latest achievement in motor car construction, in Washington, D. C. Thursday, March 9. The exact number checked at the show rooms of Harper Brothers, 1128-30 Connecticut avenue, where the car was exhibited between 8 a. m. and 10 p. m., was 26,840. Durant officials stated that more than 1000 retail orders were placed with deposits for models of the new car with de-

livery promised in June. The Washington Herald characterized the exhibition as the most remarkable demonstration of interest in a commercial product ever witnessed in the eastern states.

Since Mr. Durant announced three weeks ago that he would produce a four-cylinder, five-passenger automobile to sell at \$348, the country has awaited its showing, anticipating the possibility of something out of the ordinary in motor car production.

THE Star is a conventional type automobile, with recognized standard parts. From semi-elliptic springs to vacuum feed gasoline tank and electrical equipment it confirms the early conjecture that its first showing would startle the industry.

"The new product is to be known as the Star Car," said Mr. Durant. "It is to be manufactured by Durant Motors, Incorporated, under a contract with the Star Motor Car Company, which will control the distribution of the car in the United States and its possessions."

The Star car is powered with a Red Seal Continental motor. It has a disc clutch, selective sliding transmission with three speeds forward and reverse, Timken bearings front and rear, Timken rear axle, conventional hand lever brake, internal and external brake bands and full chassis of conventional type with Hotchkiss type driving shaft.

The "tubular backbone," an exclusive Durant feature, gives the chassis unusual rigidity and strength. The body is full five-passenger and its streamline design includes a high hood and slanting windshield. The Star will be produced in all popular models. Mr. Durant promised quantity production by June 1, but would not specify which, if any, of his five plants will be used in its manufacture. After being shown in Washington the



Specialized Parts Make This Latest Durant Product a Real Car.

Star car was shipped by express to Boston.

Specifications of the Star Car.

| | |
|--|-------|
| Chassis | \$285 |
| Phaeton | 348 |
| Phaeton with starter and demountable rims | 443 |
| Runabout | 319 |
| Runabout with starter and demountable rims | 414 |
| Coupe with starter and demountable rims | 580 |

| | |
|---|-----|
| Sedan with starter and demountable rims | 645 |
| Engine—Continental 3½ by 4¼ inches, four cylinders. | |
| Rear Axle—Timken. | |
| Gearset—Selective three speed. | |
| Clutch—Single plate disc. | |
| Universal Joints—Spicer. | |
| Springs—Semi-elliptic, underslung. | |
| Gasoline Feed—Stewart vacuum system. | |
| Electrical System—Auto-Lite | |
| Wheelbase—102 inches | |

FIAT BUILT IN ITALY

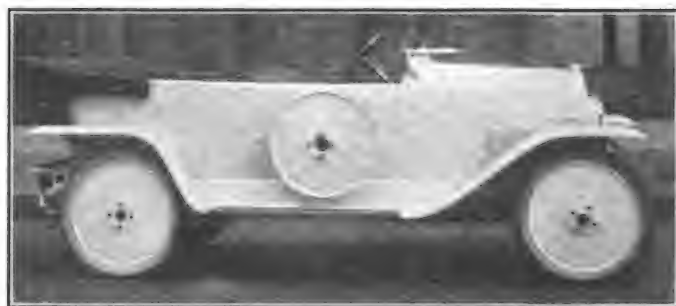
THE Fiat line of passenger cars manufactured at Turin, Italy, and sold in this country from the importing branch of the company at 150 West 57th street, New York City, offers to discriminating buyers a line of imported passenger cars of three distinct models.

THE smaller, designed as Model 501, is a small light car, designed for speed and general service and although the price is well within the range of buyers, it has incorporated in its construction all the qualities of comfort, reliability and endurance of the higher priced models, includes all of the improvements found in the larger models and only differs from them in dimension of parts.

Several bodies are available on the model 501 chassis, the four-passenger touring car, the saloon type limousine and the three-seater spyder. Model 505 is a medium sized car with power and

preferred by discriminating purchasers who desire a medium weight car of distinguished appearance for formal occasions. Two types of bodies are mounted on this chassis, a six-passenger touring

One of Three Fiat Models That Are Being Well Received by American Motorists.



available body space sufficient so that it may be used for a great variety of work. This model combines elegance, comfort and speed, can be used equally as well in the city as in the country and is much

body or a luxe landaulet torpedo fitted with seats for six passengers.

Model 510 is a luxurious car equipped with a six-cylinder engine possessing all of the qualities of silence and flexibility.

LEGAL POINTS

By SAMUEL WANT

A "shyster" automobile dealer—one of the few in the business—was indicted in New York a few days ago in connection with notes which he took for payments due on cars sold by him. It is claimed that when he sold cars on the instalment plan he took notes from the purchasers, discounted these notes with a banking house, then collected the payments and pocketed them. When the notes came due the makers were called on for payment by the banking house, and thus the facts came to light.

THE law is very clear to the effect that the holder of a note who bought the same in the ordinary course of business is entitled to collect the same, regardless of any claims which the maker of the note may be able to set up against the original payee—the dealer. If the dealer has given a warranty or other special contract, or if he has already collected part or all of the amount due on the note, these facts cannot be relied upon as against the bona fide holder of the note.

Protection against this risk is afforded only when the following precautions are taken: (1) all agreements upon which the purchaser relies as the basis of his purchase either should be embodied in the notes verbatim, or else should be covered by a reference in the notes to the contract of purchase as a part of the transaction expressed by the notes; (2) no payment should be made on such notes unless the purchaser sees that they are written on the back of the notes as credits, and no final settlement should be made unless the notes are returned, marked paid or otherwise cancelled; (3) the amount of each note should be perforated or otherwise impressed on the instrument by a check protector or other similar device.

Of course, where the dealer is a man of unquestionable responsibility these precautions may appear superfluous, but lawyers learn only too well that it is the man who has the complete confidence of another that most frequently is caught in the meshes of the law, with consequent loss to the people who dealt with him.

The observance of precautions which the courts have declared to be essential to safety will be endorsed by all reliable dealers, who will be the first to concede the propriety of protecting every purchaser against unscrupulous dealing, re-

gardless of the inherent necessity of this protection in the given case.

Law Elasticity.

A RECENT Michigan case shows the elasticity of the law in meeting special situations. A manufacturer of a well known car which was being sold for the builder by a Detroit dealer decided to handle its sales on its own account. It proposed to its dealer to buy out his stock and fixtures and also his lease. The lease was extremely valuable owing to the fact that the premises had been successfully used for many years in the sale of the particular car. A price was agreed upon—admittedly a ridiculously low price—and subsequently the dealer repented of his deal and his generosity and refused to comply with his contract. He preferred to be sued and to pay the necessary damages. But the law stepped in and went much further. Through the remedy known to lawyers as "specific performance," the court ordered the dealer to comply in terms with the specific provisions of his agreement. The evidence showed that under the special circumstances of such a case it would be impossible to estimate on any mathematical basis the amount of loss that the manufacturer would sustain as a result of the breach of contract, and the court decided that upon this ground the dealer should be compelled to make good by the only other avenue available—specific performance of his contract.

This case illustrates the legal rule that a man cannot escape performance of his contract simply because it works out to his great loss or because he has made a gross mistake or has acted very improvidently. Of course, if he were imposed upon through fraud this would alter the situation.

Motorist Sues County.

A RECENT Ohio case disposes of a problem that gives a great deal of trouble in the trial of automobile accident cases involving defective streets or other external conditions. In this case an accident had resulted from the alleged negligence of the county authorities in failing to keep the roads in proper condition. The suit was against the county. The motorist, for the purpose of showing that the county recognized the defective condition of the road in question at the time of the accident, wanted to prove that after the accident the county immediately got busy and repaired the alleged defects. Such evidence undoubtedly would have considerable weight with a jury, where the county denies that the road was not properly maintained, but the court decided that such evidence is not permissible.

The reasons for the court's ruling are sound. It points out that if such evidence were admitted, that fact would always deter counties from making improvements, while litigation is pending, for they would fear that their activity in this direction would be evidence against them. Also, the court said, such evidence would have a tendency to divert the minds of the jury from their primary duty to reach a conclusion upon all the evidence in the case, rather than upon inference from indirect facts.

Courts Differ.

IN A RECENT New York case a motor transfer company was sued for its failure to deliver a package. The evidence indicated that the package had been stolen by one of the company's employees. It also appeared that the shipper had grossly undervalued his package, so as to avoid the extra charges that would have been payable upon a proper valuation. Upon this state of facts the court decided that the motor company could not be held responsible for the full value of the package.

In contrast to the preceding case the Michigan Supreme Court recently decided that under ordinary conditions a motor transfer company is liable for the full value of goods entrusted to it for shipment and lost in transit, notwithstanding the fact that on the back of the receipt given the shipper there is an express limitation of the company's liability to a given amount, this amount being less than the value of the goods in the particular case.

Theft Policies.

MOST theft policies covering automobiles contain a provision to the effect that the insurance company may not be called upon to pay the loss until after the lapse of a stipulated period (usually 60 days) following the filing of the proof of loss. There is a further provision to the effect that if the car is recovered and tendered to the insured owner this shall absolve the company from liability except for damages inflicted upon the car after the theft.

These provisions were involved in a recent decision of the supreme court of Illinois. This court decided that the second provision must be construed as meaning that the company has a right to require the owner to accept a return of the car at any time within the period covered by the first provision, but that after the lapse of such period, if the car is recovered by the insurance company, the owner may refuse to accept it and may collect the amount of the policy as if the car had not been found.

TRAVEL DECALOGUE.

IN THE hope of establishing greater coordination between free travel information agencies, municipalities and chambers of commerce throughout the United States, the tourist bureau of the Denver Civic and Commercial Association has suggested the following as the 10 commandments of travel:

1. An exchange of scenic, industrial and agricultural literature through tourist information racks means greater returns in travel sales for all communities.
2. The automobile camp is another clearing house for the local distribution of tourist dollars to business interests.
3. Don't worry about the tourist "crop;" it has no failures and should be given equal consideration with other harvests.
4. Consult your hotel and restaurant men as to how they can improve their service; it may be good now, but try to make it better.
5. A tourist's sense of appreciation is as keen riding in a flivver as in a railroad observation car, so clean up and paint your town.
6. Dedicate an all-states avenue in the camp grounds and show civic appreciation of their presence in an all-states day celebration for tourists in the height of the season.
7. Appoint committees to greet tourists and to hand them literature pertaining to your district and regarding side trips.
8. Encourage an exchange of camp fire tales of adventure and see that tourists are supplied with church and amusement directories.
9. Promote a standardization of camp facilities and regulate services rendered.
10. Remember that the tourist of today is the citizen of tomorrow.

TRAVEL TUESDAY OR WEDNESDAY.

IF YOU are going on an automobile trip and wish to avoid all possible traffic, you should go on Tuesday or Wednesday. Such is the conclusion reached from a study of a traffic census taken recently by the Bureau of Public Roads, United States Department of Agriculture, on one of the most traveled roads in the United States. If you want to go at an hour when there will be the least traffic, start between 2 and 3 o'clock in the morning.

Instalment Plan.

IN A RECENT decision of the supreme court of Washington it appears that a dealer sold a car upon the instalment plan, taking a conditional sale of contract from the buyer before delivering the car. On the same day the dealer transferred the contract to his bank as security for a loan. Both the original contract and the assignment of the bank were promptly recorded. The buyer of the car was unable or unwilling to continue his payments and returned the machine to the dealer. The latter then sold it to another person for cash without disclosing the claim of the bank. Suit was instituted by the bank against the second purchaser.

Of course the court awarded the car to the bank.

This case emphasizes the risks involved

in the purchase of second hand cars except from responsible dealers. Safety is assured in such cases only when the public records are examined for adverse claims, and even then the risk is great if you are dealing with an irresponsible person.

In another decision of the same court a warning is found on the opposite side of such transactions. According to this ruling if the seller takes a conditional contract of sale and also a note for the unpaid balance the lien of the contract is good only so long as the note and contract are held together. The act of the dealer in separating the two, by discounting the note at his bank, and retaining the contract in his own hands, nullifies the later. In such a case, therefore, the court holds a subsequent purchaser of the car from the first purchaser gets

a clear title as against the dealer, although the first purchaser has not paid his note.

Street Crossings.

TO DRIVE over a street crossing without slackening speed or sounding any warning is negligence, rendering the motorist liable for injuries sustained by a pedestrian at the crossing. Under such circumstances even the failure of the pedestrian to observe the ordinary precaution to look both ways before stepping from the sidewalk will not necessarily excuse the motorist, since it may be reasonably inferred that the former relied upon the legal rule that autoists approaching a crossing must give warning and that, not having heard any warning, he had considered it safe to cross.

Repairs Up to Tenant.

THE rule that the duty to make ordinary repairs to buildings rests upon the tenant and not upon the landlord is too often overlooked in the execution of leases, in which a contrary stipulation must be made if the tenant wishes to escape this very comprehensive sphere of possible loss and injury. To garage keepers this rule is poignantly applied in a recent decision relating to a defective elevator apparatus used in carrying cars from one floor of a garage to another.

In the case in question the lease contained no stipulation on the subject of repairs, so that the above rule applied. The elevator refused to function properly on the occasion which gave rise to the case, and an automobile was damaged beyond repair. There was no question as to the right of the owner of the car to compensation, and the litigation arose over the contention of the tenant that the owner of the building was the one liable, because he had knowledge of the defective condition of the elevator and paid no attention to the tenant's requests for repairs. Under the rule stated before the tenant was compelled to pay the loss.

Answers to Questions.

Q. A. M. S. Company—Your four inquiries are embraced in the following question:

Is an automobile "used" or "second hand" within the meaning of laws relating to the sale and licensing of such cars, where the following transactions have taken place: (1) The manufacturer sells and delivers the car to a dealer; (2) the dealer sells the car in the usual course of business, taking a deposit of \$100 and holding the car for the payment of the balance; (3) the customer fails to pay the balance, so the dealer resells the car, purchaser being this time an associate dealer; (4) the new purchaser sells the car to a retail customer in the usual course. The car has not been in use during the course of these transactions.

A. This car is not "used" or "second hand" within the meaning of the law. It is for all purposes a "new" car.

IS IT TO BE STATE TESTED GASOLINE?

BELOW is published, in part, an act submitted to the law-makers of Rhode Island. The object of this act is to standardize the quality of gasoline sold in the state and to provide means by which the act, if it becomes a law, may be rigidly enforced and a check kept on all gasoline handled by dealers. All told, the Rhode Island registration lists show that there are close to 60,000 every-day users of gasoline and the interest manifested by them in this act is pronounced. The author of the act is now an extremely popular member of the assembly from the viewpoint of Rhode Island car owners.

SECTION 1. For the purpose of this act all gasoline which may or can be used for illuminating, heating or power purposes, shall be deemed to be subject to the inspection and control as herein provided for; and it shall be unlawful for any person to sell any gasoline that has a gravity less than 55 degrees Beaume as determined by registered hydrometer Beaume scale at a temperature of 60 degrees, Fahrenheit, for any such purpose, that has not been so inspected and approved.

MOTOR gasoline shall also comply with the following specifications:
Quality—Gasoline to be high grade, refined and free from water and all impurities.

Inspection—Before being sold or offered for sale the gasoline shall be inspected. The samples immediately after drawing will be retained in a clean, absolutely tight closed vessel and a sample for test taken from the mixture in this vessel directly into the test vessel.

Test—One hundred cubic centimeters shall be taken as a test sample and these rules shall be followed:

(a) The initial boiling point must not be higher than 140 degrees Fahrenheit.

(b) Twenty per cent. of the sample must distill below 221 degrees Fahrenheit.

(c) Forty-five per cent must distill below 300 degrees Fahrenheit.

(d) Ninety per cent. must distill below 430 degrees Fahrenheit.

(e) The end or dry point of distillation must not be higher than 450 degrees Fahrenheit.

(f) After complete distillation the residue shall not be over three per cent.

Measures—All standard measures used for the distribution of gasoline shall be subject to inspection and to condemnation if not in accordance with the standard.

Cleanliness—All tanks and other containers shall be originally free from foreign substance. No material fluid or substance shall be sold or offered for sale or labelled "gasoline" which contains more than five per cent. of solid matter.

Sec. 2. For the purpose of enforcing the provisions of this act, the office of the inspector of gasoline is hereby created, and within 30 days after the

passage of this act the governor shall appoint, by and with the consent of the senate, a suitable person who shall act as an inspector of gasoline. If the senate is not in session at the time of such appointment, the appointment shall be effective until acted upon by the senate next in session.

Such inspector of gasoline, hereinafter called the inspector, shall be appointed for a term of three years, or until his successor is duly appointed and qualified. Said inspector shall give a bond in the sum of \$10,000, to be approved by the governor, for the faithful performance of the duties of his office. * * *

Said inspector must appoint, with the approval of the governor, such deputies as may be required, not exceeding six in number, who shall perform the duties under the direction of the inspector, and may reside or be located at such place in the state which will permit the most convenient execution of their duties. * * *

The inspector must require a deputy to file a bond for the benefit and use of the state, in the sum of \$5000; and for breach thereof, the inspector shall have the right of action in his own name for the recovery of any loss, by reason of any fault by a deputy; and the state shall also have right of action to recover loss, if any, it may have sustained through default of a deputy.

Sec. 3. The said inspector appointed under the provisions of section 2 of this act shall receive an annual salary of \$3000. The said deputy inspectors appointed under the provisions of section two of this act shall receive a monthly salary of \$150 per month.

Said inspector may employ necessary clerical assistance and may incur such expenses as may be required.

For the purpose of paying the said salaries and for other necessary expenses of said office, the sum of \$17,000 is hereby annually appropriated. * * *

Sec. 5. The inspector and any deputy is given power to make an inspection of oils in whosever hands such oils may be found; and is given power to investigate in order to determine whether or not such oils have been properly inspected before being offered for sale; and is given power to ascertain whether or not inspection fees have been paid. Upon completing such inspection the inspector or his deputies may exact the fee of two mills per gallon of gasoline, and shall place upon the container an inspection stamp properly cancelled, which will indicate that the gasoline contained within said container has been properly inspected, or when gasoline is in transit,

or in a container not readily stamped, he may issue a certificate properly countersigned, stating that he has made such inspection. Said gasoline after being stamped shall not be reinspected, unless in the belief of the inspector or his deputies a fraud has been committed and the gasoline is being sold in violation of law.

Sec. 6. In the performance of his duties the inspector or his deputies may inspect all records relative to receiving, forwarding, or transporting oils or gasoline: provided, however, that the inspector or his deputies must not divulge any knowledge concerning these records, or in any way permit any one to receive information concerning such records, which would be prejudicial to the owner of such records.

Sec. 7. In the performance of his duties, the inspector or his deputies is given power to administer oaths, and he or his deputies shall not be liable for costs in any prosecution which may occur under the provisions of this act. It is hereby made the duty of the inspector to prosecute all violations of this act. * * *

Sec. 10. No inspector or deputy while in office is permitted to be directly or indirectly interested in manufacturing or selling any oils or gasoline, nor is he permitted for the purpose of inspecting, testing or gauging, to take away or appropriate for his own use, or for the use of others, any part of said oils.

Sec. 11. The inspector and deputies must keep a correct record of all oils inspected by them, of all stamps, certificates and other property coming into their possession, and of the persons and corporations to whom they are issued, in a book provided by the state, which book is to be open to inspection by the governor, or any person designated by him as well as all other persons interested. Detailed reports to the governor must be made annually by the inspector's office of the business transacted. All money collected as inspection fees must be remitted to the general treasurer once each month.

Sec. 14. Any person violating any of the provisions of this chapter shall be guilty of a misdemeanor, and for first offense shall be fined not exceeding \$20, for second offense shall be fined not exceeding \$100 and for third offense shall be fined not exceeding \$500, or imprisoned in the Providence county jail for 30 days.

Sec. 15. This act shall take effect upon its passage, and all acts and parts of acts inconsistent herewith are hereby repealed.

Organization Headed by Well-Known Men Will Manufacture Vacuumeter

**BACKERS CONFIDENT THAT HIGHLY SPECIALIZED DEVICE WHICH
KEEPS ACCURATE CHECK ON FUEL SYSTEM AND ELIMINATES ALL
GUESS-WORK ON PART OF DRIVER WILL HAVE EXTENSIVE MARKET.**

THE one word that is most frequently used in automotive talk these days is "performance." Manufacturers talk about performance, and users brag about the performance of their cars in proportion to their optimism. Anything, therefore, which will improve performance is a step forward, and one which will be gladly received by the public.

THE thousand of ideas for the improvement of carburetion received by the patent office, proves that the need of better carburetion is the dominant idea in the automotive field. As a chain is no stronger than its weakest link, so an automobile is no better than its gasoline performance. Many are the methods used to increase fuel energy by aiding vaporization, such as water-jacketed manifolds and other types of heating units, all with but one object in view—more power with less fuel.

When the vacuum feed system is functioning properly, no one can find fault; it is only when it fails to do so that trouble occurs. When such is the case, if the trouble can be easily located the necessary steps can be taken to enable the carburetor to again function at its highest efficiency. The great need, therefore, has not been better methods of carburetion, but some means of immediately detecting and locating the cause of carbureting troubles.

There are various causes of carburetion troubles, such as foreign matter in

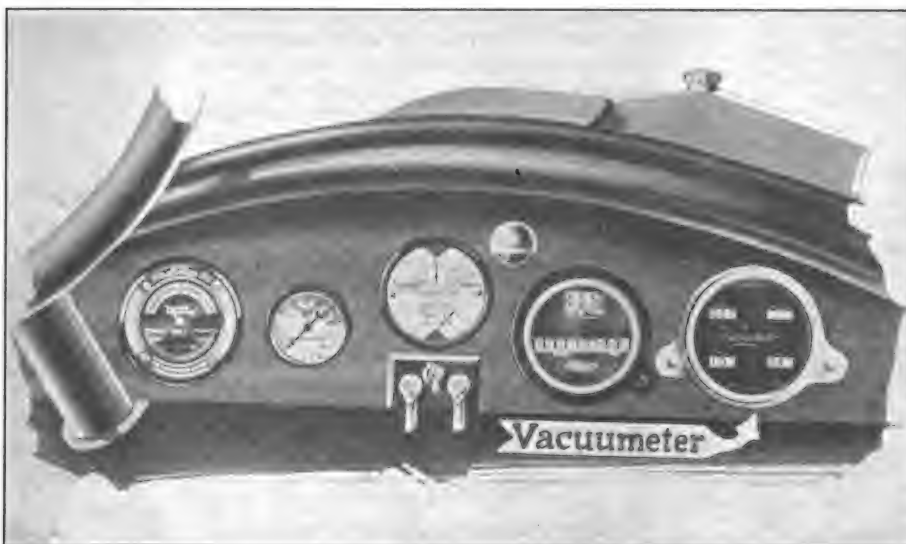
the various lines, mechanical derangement of parts of vacuum systems and leaks in the system. While filtering systems have been introduced and perfected to insure clean gasoline entering the carburetor, these devices do not take care

To perform properly, the various reciprocating units of a car must be in proper relative function. Granting that all parts work together as they should, the entire performance is dependent upon one thing—gasoline carburetion. Since carburetion is the source of all performance, it naturally follows that improper carburetion is the source of most trouble.

immediately warn of faulty feed system and mechanical derangements, insuring perfect performance and avoiding expensive repair bills. Many experiments have been made in the last 10 years, but it remained for J. J. Albright, an automotive engineer in Columbus, Ga., to solve the problem and provide a precision instrument which supplies the last great requirement for automobile performance.

The modern instrument boards have been carrying meters for indicating all necessary information except the one of which we have spoken. The speedometer shows miles per hour, miles per trip, and total mileage, but its greatest value comes from the application of this information to practical use in determining

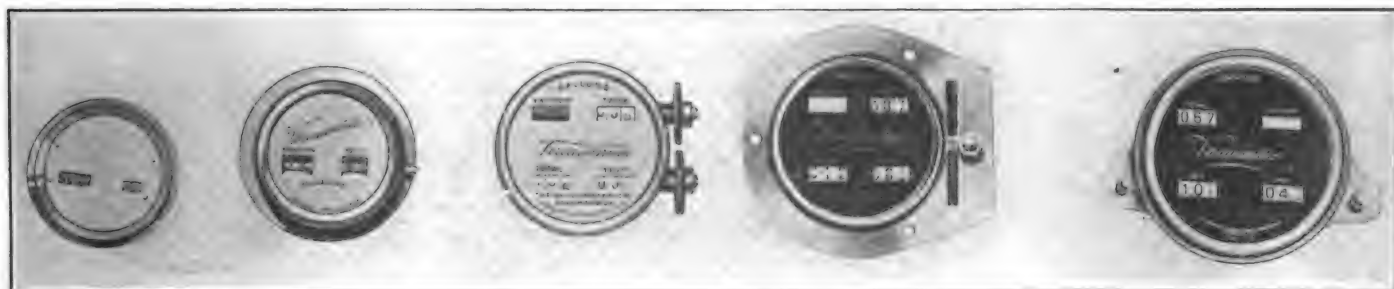
proper lubricating periods, tire performance and similar items. The ammeter shows at a glance the electrical performance and immediately indicates improper functioning of the generator. The oil meter indicates the lubricating performance, the motor meter indicates the performance of the cooling system



The Vacuumeter. Artistically Designed and Finished. Fits in Well with Its Surroundings, Enhancing the Appearance of the Instrument Board.

of clogging in the feed lines before reaching the filtering device. When such obstruction occurs, it has heretofore been very hard to detect and locate. The same is true of small leaks and other difficulties.

Automotive engineers have realized for years the need of a device which would



This Picture Graphically Illustrates the Evolution of the Vacuumeter Through Five Models. Left to Right—Model A, 1918; Model B, 1919; Model C, 1920; Model D, 1921; Model E, 1922.

and, like all valuable recording meters, has now found its proper place on the instrument board.

While the great value of all these instruments cannot be disputed, there still has been one great lack, which is now supplied in the Vacuumeter. It was a realization of this great need which set Mr. Albright to work perfecting a meter that would register exactly all necessary information pertaining to vacuum feed systems—a meter that would give the driver the assurance that the fuel system was in proper function, or warn him that faulty operation was taking place and give this information in sufficient time to avoid serious damage to his motor or actual stoppage of his engine.

The vacuum feed system, because of its superiority, has practically superseded pressure and gravity types of fuel feed and only requires mechanical supervision.

In tackling this proposition, Mr. Albright realized that it would be no child's play. Many obstacles confronted him, which had baffled other experts, and of which he was well aware. The instrument, to be of any value, must be a precision instrument. It has taken four years of concentration to develop the vacuumeter to its present state of perfection.

What the Vacuumeter Does.

The Vacuumeter, it is claimed, will supply the following information with absolute precision:

1. The exact amount of gasoline in supply tank at all times.
2. The exact amount consumed on trip, or for any given period.
3. Total amount consumed.
4. The exact miles per gallon at any instant.
5. That car has been used without permission.
6. That vacuum feed system is in proper function.
7. If out of order, it points out the trouble instantly, in advance of actual damage to motor, or waste of fuel.



C. M. Barnes, President and General Manager, Vacuumeter Manufacturing Corporation.

All this is shown at a glance. It does not require an engineer to realize the tremendous advantage of this indicator; any motorist will hail with joy an instrument which will supply such information.

It will be interesting to note how the instrument provides this information. The Vacuumeter is operated by the vacuum created by the engine—the same vacuum which operates the vacuum feed system. Therefore, any leak in the system is indicated by a partial red signal on the window marked "vacuum." The vacuum system operates approximately 32 times to transfer a gallon of gasoline from the supply tank to the vacuum tank, the Vacuumeter checking every one of these operations, giving detailed reports of every function of the system and consequently on all of the gasoline consumed.

The Effect of Leaks.

Direct waste of gasoline through leaks is a more common occurrence than most car owners realize. A flooding carburetor and leaky connection at either end of the gravity feed line, or a leak in the bottom of the vacuum tank itself, will drain the vacuum tank in a short time. Enough gasoline may remain in the carburetor to start the motor, and the tank will refill by several rapid operations of the system. The fact that sufficient gasoline remained in the carburetor to start the motor was of great convenience. It was also a blindfold to the owner's knowledge of costly fuel loss, as well as of extra fire hazard, which is far more serious. A quart of gasoline in the drip tank is as dangerous as a match in a powder mill.

The Vacuumeter gives notice to the driver every time the vacuum tank is drained, or partially drained, through the excess number of operations necessary to refill it.

Feed Line Obstruction.

Stoppage may occur in any part of the

gasoline line from the main supply tank to the vacuum tank. It seldom develops suddenly, but as a rule is built up by an accumulation of small particles of dirt and other foreign substances in the screen or in constricted portions of the line.

But the first knowledge the driver now has of the trouble is when his motor stops.

The Vacuumeter warns the driver as soon as the slightest accumulation interferes with the normal flow of fuel.

Flooding.

Vacuum tanks flood, due to derangement of the internal mechanism. In extreme cases the condition will affect the operation of the motor and the accepted belief is that the flooding will always show up. This mistake, like so many others, is due to the fact that there never has been any way to detect this trouble. It is true that a vacuum tank floods at times without causing any unusual action of the motor. The damage that may be done to a motor is only limited by the value of the motor.

In other words, a flooding vacuum tank if allowed to continue may possibly burn out the engine. The gasoline drawn into the manifold from the suction line will wash the oil from the piston and rings, go down into the crank case, mix with the oil and destroy its lubricating value. The oil gauge will show that the liquid stands at the proper level in the crank case, but it cannot show what the liquid is.

The Moto-Meter Company, manufacturers of the well known Boyce Moto-Meter, warns motorists of this prevalent source of overheating and damage. While the gauge may say plenty of oil, the quantity may be in reality a thin mixture of gasoline and lubricating oil, the greater proportion of which is gasoline, possessing little or no lubricating qualities.

Flooding, like all the other troubles that may develop in a vacuum system, is



H. E. Armstrong, General Sales Manager Vacuumeter Manufacturing Corporation.



J. J. Albright, Chief Engineer Vacuumeter Manufacturing Corporation, Inventor of Vacuumeter.

instantly indicated by the Vacuumeter. Long before an engine can score its cylinders, burn out bearings or suffer other damage almost beyond repair, the Vacuumeter has shown that there is something wrong and has also shown exactly what the trouble is.

Reading the Vacuumeter.

The window marked "vacuum" changes from white to red with every operation of the vacuum tank, remaining red a duration of time necessary to transfer a charge of gasoline from the supply tank to the vacuum tank. A complete "red signal" gives you positive assurance that the vacuum system is in proper function. Leaks, obstructions, flooding or other faulty performance are shown by various other signals.

The amount of gasoline removed from the supply tank is automatically subtracted, leaving under the word "tank," the remaining amount of gasoline in the supply tank. And since the amount removed has been consumed, it is added to the reading of the window marked "trip." The "trip" window is set O-O at the beginning of a trip, just as the speedometer has been set, and as a speedometer reading is in miles and tenth miles, the Vacuumeter reading is shown in gallons and tenth gallons. A mental operation of division, the one into the other, enables you to know the exact mileage per gallon of gasoline used. As the gasoline is used in fractional parts, the total amount of gasoline consumed is accumulated under the reading marked "total," which cannot be reset.

What is the cost of faulty gasoline performance? What does the gallon of gasoline give you for the money you give for it? Each gallon should contain the same fuel energy. Where maximum fuel energy is not delivered, maximum economy cannot be enjoyed.

Development of the "Vacuumeter."

An accompanying illustration shows the evolution of Mr. Albright's inven-



J. R. Dangler, Vice President, Secretary and Treasurer Vacuumeter Manufacturing Corporation.

tion, which caused him deep concern in the early stages of development. The last year, however, has been devoted to perfecting the instrument, and letters patent have been granted on every step as a precision instrument by the United States and Canadian patent offices, with patents pending in the principal foreign countries.

Due to the variation in vacuum feed systems of the amount of gasoline drawn from the supply tank with each operation, it was of course necessary to first take into consideration a positive means of calibration. In certain other attempts at the construction of a gasoline meter, the engineers have employed ratchet systems. But with a ratchet the reading depends upon a tooth by tooth operation. Where the amounts of fuel varied, accuracy could not be obtained because it is impossible to split a tooth in a ratchet. Mr. Albright soon found that it would be impossible to use ratchets in the construction of the meter and as a result the battle with calibration began. After exhaustive tests in which discouraging disappointments naturally arose, he finally perfected the present positive clutch which makes it possible to measure the fuel to the drop.

It is easily seen by the accompanying photograph that many changes were made not only as to the internal construction, but the exterior appearance of the meter as well. The original meters registered only the trip and total consumption, the trip window indicating the gas in gallons and fractional gallons. But throughout the progress the meter began to look more presentable as the photographs show.

While the "Trip" and "Total" windows furnish almost indispensable information, the additional advantage that would be derived from showing the exact amount of fuel in the supply tank at all times soon became apparent. It was this thought that brought into existence model "C" and with it the window marked "Vacuum" to give the owner the

assurance that his vacuum feed system was in proper function, reporting each individual operation and instantly showing faulty performance when it occurs. This gives the meter, as will be seen in the photographs, four very necessary window readings as against two in the original meter.

The Organization.

At first thought Mr. Albright did not realize the magnitude of the task before him, but, he soon discovered that it was a gigantic undertaking, requiring the expenditure of much money to properly develop what he knew was the one missing link in the operation of the automobile. At this stage of the work he secured the interest and financial support of James H. Farish and B. Crawford Jenkins, both of Columbus, Ga., and through the untiring efforts of this trio nothing was allowed to interfere with the progress of the work. Mr. Albright traveled throughout the automobile belt contracting for odometer construction, at which time the Van Sicklen Company of Elgin, Ill., the Veedor Company of Hartford, Conn., and the Elgin Company of Elgin, Ill., were given contracts for the manufacture of odometers and dials, and at the same time the Allemitte Company of Chicago built the dies for the various parts, these dies having a factory capacity of 1000 parts per day each.

A copartnership was then formed between the three original persons and while the organization did not have the general business administration necessary to the undertaking of production and distribution, it was successful to the extent that some 25,000 meters now are successfully operating on automobiles throughout the United States. In less than three years, with an original investment of \$4000 the business grew to a point where they could show tangible assets well in excess of \$100,000, having at that time a factory output of 1000 finished units daily.

Distribution so taxed production that it was soon evident that a general reorganization would have to be made and



James H. Farish, Vice President and Director, Vacuumeter Manufacturing Corporation.



B. Crawford Jenkins, Director of Vacuumeter Manufacturing Corporation.

to this end the company incorporated, making arrangements to move the executive offices and plant immediately to the automobile belt, and after a careful analysis it was decided that Cleveland, O., was to be the permanent home of this organization.

In the reorganization work every care was exercised in surrounding the product with men of business caliber, remembering in this reorganization the necessity of general expansion and the important factor of quantity production and distribution.

J. J. Albright, the inventor, will be chief engineer of the new organization. The rest of the personnel is as follows:

C. M. Barnes, formerly of the National Cash Register Company and the Burroughs Adding Machine Company, resigned as Vice President and General Manager of Packard Cleveland Motor Company to accept the position tendered him as President and General Manager of the new corporation, with executive offices in the Pulkley Building, Cleveland.

H. E. Armstrong, Vice President and general sales manager, was formerly with the Burroughs Adding Machine Company, the Burd High Compression Ring Company of Rockford, Ill., and is a member of the S. A. E.

J. R. Dangler, Vice President and also Secretary and Treasurer, was formerly assistant to the president of the Central Steel Company of Massillon, O.

James H. Farish, previously mentioned as one of the original trio responsible for the development of Vacuumeter, is a vice president and a director under the reorganization plan.

In addition to the above the directorate includes B. Crawford Jenkins, one of the original backers of Vacuumeter; J. F. Gillen of Chicago and F. E. Bruce, one of Cleveland's leading insurance men.

Mr. Gillen also is manager of the central division and like Mr. Barnes and Mr. Armstrong, formerly was with the National Cash Register Company and the Burroughs Adding Machine Company, being well known throughout the country. Mr. Gillen was District Manager for the Burroughs Adding Machine Company, with offices in Chicago, for the last 10 years.

The gigantic problem immediately confronting the executives was a decision as to the best policy for production and distribution. The chart graphically explains the final conclusions for organization policy throughout, which were proved successful through experience in marketing Vacuumeter and other specialties.

Distribution will be handled through

five divisions in the United States, with resident division managers supervising their respective territories, from factory branch offices located in Chicago, New York, Atlanta, Kansas City and San Francisco.

Supervision of the production department will be in charge of a man prominent in the automobile industry, and the announcement of this appointment will also be made in the near future, as will be the Sales Promotion and Practical Operations departments.

Advertising will be handled through

The sole mode of distribution is to be through authorized exclusive distributors. For instance, in the case of Cuyahoga county, Ohio, the authorized distributor will have sole control of all Vacuumeters to be distributed within the county, his wholesale distribution to be through sub-dealers, these sub-dealers being automobile distributors, accessory stores and garages, and the corporation has so thoroughly worked out the matter of distribution that the distributors will not be allowed to sell or install this product until they have completed a standard

sales and practical operations course provided by the company and stipulated in the contracts.

The annual quotas of the exclusive distributors are based on car registrations in their respective territories and after establishing these distributors the sales promotion department of the corporation will go right into the business of the distributor, taking complete charge of his Vacuumeter business through the educational period. During this training his sales department

will be educated in the field, thus actually making a stock turnover for the distributor while the practical operations department is educating the mechanical staff of the distributor in the care and repair of vacuum feed systems, installation of the Vacuumeter and other details pertaining to the work.

The personnel of the sales and practical operations staff is to be recruited from a sales school operated by the company and among the sales staff will be many well known specialty salesmen throughout the country. The names of these individuals also will be announced in the near future.

The distributors will be given every assistance, especially in the general advertising and publicity work, as this will all be done on a standardization basis.

Pahassee Tepee, the Buffalo Bill Museum in Denver Mountain Parks System, contains the knife which Colonel Cody scalped Yellow Hand, the Sioux chief, after the Custer massacre, and the gun with which he killed 4,000 buffalo in one year for the Union Pacific road.

Rocky Mountain National Park, in Colorado, had 273,737 visitors from every state in the Union last year, which was more than the combined attendance of Yellowstone, Yosemite, Glacier, Grand Canyon and Lassen National Parks.

Colorado has the highest yacht anchorage in the world at Grand Lake at an altitude of 8369 feet, where a regatta is held every summer for a Lipton cup.

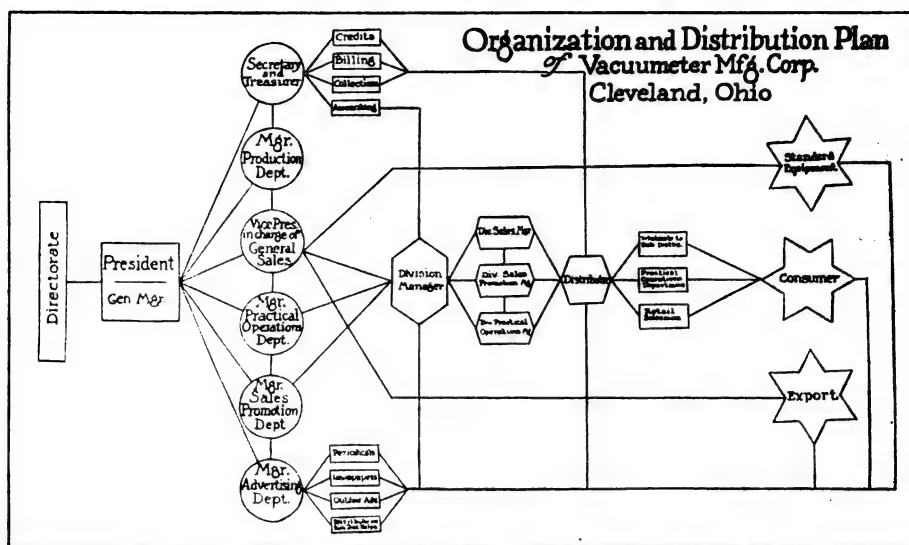


Chart Showing Organization and Distribution Plan of Company.

the Schulte-Tiffany Company, a Cleveland advertising agency, well known in the national advertising field. The national as well as local advertising appropriations are very substantial, and advertising plans are being worked out in very careful detail. The sales promotion department has worked out some very comprehensive and attractive "dealers' helps" ideas that will directly aid distributors throughout the country.

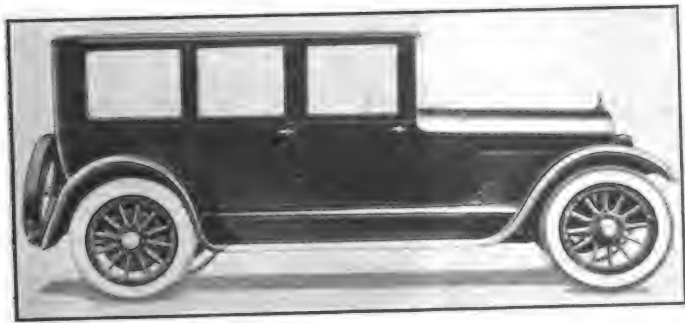
THE VACUUMETER WILL ACCURATELY TELL—

1. The exact amount of gasoline in supply tank at all times.
2. The exact amount consumed on trip, or for any given period.
3. Total amount consumed.
4. The exact miles per gallon at any instant.
5. That car has been used without permission.
6. That vacuum feed system is in proper function.

If the fuel system is out of order it points out the trouble instantly in advance of actual damage to motor, or waste of fuel.

CASE SIX DISTINCTIVE IN DESIGN

IN THE Case Six, known as the Model X, the manufacturers have produced a car which possesses some distinctive new features in addition to those usually found in fine motor cars. In all tests it has performed remarkably well. The car is low, only 74 inches high with the top raised. The wheelbase is 122 inches and 32-inch wheels are used.



Five Passenger
Case Sedan.
This Fine Car Is
Amplly Powered
and Holds
the Road Well.

This model is furnished in two body types, a five-passenger touring and five-passenger sedan.

THE Case Model "X" has a wide speed range of two to 70 miles per hour in high gear. It accelerates from five to 20 miles per hour in 6½ seconds. The Case Continental engine develops 55 horsepower at 2600 revolutions per minute. It has ample power to negotiate the heaviest roads without being over-taxed. It clings to the road because of the low center of gravity, long wheelbase and unique suspension. Road clearance has not been sacrificed in securing lowness as a full 9½-inch clearance is maintained at the front axle, the lowest point of car. The rear of frame rides easily between the long resilient springs which are clamped above the axle at the extreme ends of the housing. The resulting wide spring tread and low center of gravity give stability and safety at all speeds.

PIKES PEAK RUN.

COLORADO SPRINGS, COL., April 8.—Automobile owners and manufacturers will be interested in the announcement that the Fourth Annual Pikes Peak hill climbing races, the biggest competition of the kind in the United States, will take place this year on Sept. 4.

THESE races are held over the Pikes Peak Auto Highway, the highest automobile highway in the world, starting from the five-mile station and finishing at the topmost point on Pikes Peak, America's most famous mountain,

and are the most spectacular contests of the racing season. To the car making the best time, regardless of class or event in which it is entered, goes the Penrose trophy in addition to the cash prize money. The Penrose cup given by Spencer Penrose of Colorado Springs is the most valuable trophy ever offered for a motor car competition. Cash prizes for the contest total \$2,100,000.

The course is 12 miles and 2200 feet in length and is one of the finest in the world; at any point cars can run abreast

or pass in perfect safety. Experts in road building pronounce it one of the most wonderful of all motor roads.

The events are classified as follows:

Event No. 1—Open to A. A. A. classification class "C" cars, with a piston displacement of 183 cubic inches or less.

Event No. 2—Open to A. A. A. classification class "C" cars, with a piston displacement of 183 to 300 cubic inches.

Event No. 3—Open to A. A. A. classification class "D" cars, with a piston displacement over 300 cubic inches.

LOSE DRIVING PERMITS.

MASSACHUSETTS drivers are either careless or just generally out of luck it would seem since the average daily revocation of licenses is close to the 50 mark, according to Frank A. Goodwin, state registrar of motor vehicles. The chief cause for this wholesale annulling of driving privileges is incompetency, states Mr. Goodwin, and is directly traceable to the fact that so many drivers obtained licenses without the formality of an examination, which up to a few months ago was not necessary for Bay State drivers.

TOO MUCH SPEED comes second in the list of reasons for revoking the licenses—too much "rum" follows, and the fourth cause is the careless pedestrian.

"I believe," says Mr. Goodwin, "that there can be no definite statement of what constitutes too much speed. Whether a man is going too fast or not depends entirely on conditions existing at the

time, whether he is traveling 40 miles an hour or seven miles. A driver on Washington street during the busy hours would be speeding at seven miles, while later he might not be speeding at 40. However, I don't see why any man wants to go faster than 30 miles an hour."

The rights of the pedestrian were championed by Mr. Goodwin.

"Most drivers," he said, "cannot be convinced that they are at fault in an accident. It is always the fault of the pedestrian. Now the pedestrian does not require a license, so he is not restricted. He may cross the street at any place he wants to and at any time. The automobilist, who is licensed because he is driving a machine which may kill or maim, must be prepared for anything the pedestrian may do.

"Drivers who fail to slow down on the theory that the pedestrian will do the sensible thing are merely betting a second or two of their time against a human life. We have not given such drivers the benefit of the doubt in revocations, and we do not intend to."

The United States mail trucks came in for a share of criticism from the audience, and the speaker said that while his department has no authority to require mail truck drivers to obtain a license, it is possible to suspend such a drivers' right to operate, although the government cannot be fined or punished.

Some of the duties which develop upon the registrar were described by Mr. Goodwin.

Returning stray husbands who vanish via automobile, considering all kinds of safety inventions, receiving such suggestions as that of an official who wanted all motor vehicles equipped with sleighbells, and all trucks equipped with periscopes to view the road behind, receiving bills for chickens killed by automobiles on the argument, "You licensed the d—n things, now pay for their damage," and cleaning up Zeb Something-or-other's cider mill, all are thought by citizens to be in his jurisdiction.

FOLKS HAVE AS MUCH SENSE AS CHICKENS.

"I think that if it is possible to educate chickens to caution, it ought to be possible to educate human beings," said George M. Graham, at the highway dinner of the National Automobile Chamber of Commerce recently.

"I notice the chicken is becoming very cautious. She is learning something and I say 'she' advisedly for I notice that the chicken that gets run over is always a hen.

"The rooster stands in dignified state on the side of the road and grins tolerantly while the flurried hen tries to cross back and forth in front of the car five times.

But some impulse of precaution born of maternal admonition comes to the mind of the hen of today and says, 'It is wisdom to stay on this side.'

TRAINING THE AUTO MECHANIC

TO MEET the need of car owners for better service, to assist employers to get the right kind of service men, to fit more men to become good mechanics, is the purpose of the Michigan State Auto School. This is a vocational training institution, organized in Detroit in 1910. It has grown up with the automobile industry in the automobile center, has had the cooperation of automobile manufacturers in planning its methods of training and in supplying equipment, and now has the complete approval and indorsement of practically all automobile manufacturers.



One of the Many Class Rooms of the Michigan State Auto School.

SIXTEEN thousand students have been trained there. The present attendance is about 4000 per year. The Michigan State Auto School courses are arranged to give the student a complete training in automotive service. To this end the method of "Head and Hand" training is used. In other words, each process of construction, operation and maintenance is explained as well as practised. The "theory" and the "practise" both are given.

Mechanics of experience find great benefit in this course of training, as it

brings to their attention vital points of service to car owners, and the correct way to do service work. Green men with no knowledge of automotive work are taken, and by a thorough ground work in fundamental principles, followed by practise under guidance, are made ready for development into expert mechanics. Such men are almost invariably more valuable to the employer, after a few months development, than the mechanic who has "picked up" his knowledge.

The complete catalogue of the school, a book of 188 pages, explaining all courses by picture and description, will

be sent gladly on request of any one interested. A. G. Zeller, president, states that inspection of the school is invited and secretaries are available at all times to conduct visitors through the classes, entirely without obligation.

Training is given on a quality basis only. Students are not rushed through, but are advised to go slowly and to fit themselves carefully for their life work. Practical methods and complete modern equipment are in use for every course. The instruction is made of absorbing interest from start to finish in both theory (lecture) and practical departments.

THE JORDAN "PLAYBOY"

THE motor of the Jordan series of 1922 is a six-cylinder type of Jordan design throughout and is used exclusively in the Jordan car. It is of the "L" head type, 3 5/16 by 4 3/4, and, contributing

ing used to gasify the incoming charge of fuel.

The cylinder head is easily removable, making the cylinder walls, combustion chambers, valves and piston heads convenient to reach. The new clutch, with its positive means of lubrication, and the extreme lightness obtained by elimina-

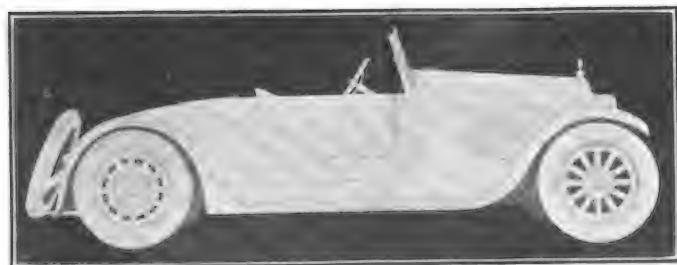
Danger from leaky radiators is avoided by hanging the core in a cork lined cradle, which removes undue strain from mounting parts. The gasoline tank is new in that it conforms to the contour of the frame and body and has an aluminum threadless cap, which is readily removed without the former danger of crossing threads.

The Alemite system of chassis lubrication is adopted to be used with heavy oil as the lubricant. Instead of the old type rear axle grease cups, Jordan uses flexible oil tubes, which are brought out near the rear end of the rear springs. A stronger frame is used, providing torsional resistance to prevent twisting and racking of bodies, and the frame sections have been deepened and carried well forward.

MOTORS 97 PER CENT. CALIFORNIA TRAFFIC.

Traffic counts by the U. S. Bureau of Public Roads show that 97.3 per cent. the vehicles on the California highways are motor propelled. Motor trucks constitute 12.48 per cent. of the total traffic.

Colorado's gold output last year was \$6,780,000 and its tourist business amounted to \$35,000,000.



The Popularity of This Model Is Explained by a Glance at Its Beautiful Lines.

toward silent operation, chains are used in the front end, replacing the gear train formerly employed. This permits adjustment of the front end chains in five minutes time with the aid of a screw driver and wrench.

CARBURETION is vastly improved, the intake manifold being designed to use all grades of gasoline with equal success, exhaust gas be-

tion of the former large catch hub, permits of unusual simplicity and ease of operation.

The electrical units are of the latest Delco types. The transmission has a longer shifting lever, bringing it within easier reach of the driver and is provided with a positive lock, which is located above the floor board sufficiently high to avoid dirt or dust. The rear axle is a new and latest Timken design, strongly reinforced and provided with an improved braking system.

The Why of the Muffler

Device Which Receives Little Attention During the Year Performs Highly Important Service—Requires Cleaning at Intervals to Prevent Excessive Back-Pressure.

NO METHOD was used to silence the exhaust from the engine in the early days of the automobile, the "hell-wagons," as they were called being allowed to go barking through the streets to the discomfort of pedestrians and other users of the road. The engines were of the single cylinder type and the sound of the exhaust was frequently as loud as a rifle shot.

THE one-cylinder engine was followed by the two and three-cylinder vertical, and later by the four-cylinder type, this latter holding the popular favor for a number of years

have to be made on second or low without the use of the cutout.

The car manufacturer of today rarely equips his cars with muffler cutout, because with the later four, six, eight, 12 and 16 cylinder engines, sufficient power is developed to handle the car under practically any condition that may be found. Improvement in the types of mufflers used also has a bearing on the power question and does much to prevent excessive back pressure.

Principle of Exhaust.

The engine exhaust can be easily compared to the report of a rifle. As the rifle bullet leaves the rifling of the barrel a report is heard which is caused by the vacuum left in the barrel being filled by the atmosphere. The rush of the atmosphere is so great that it gives a snap or loud report, according to the size of the barrel and the strength of the

force out the burned gas through the exhaust valve into the exhaust pipe and thence into the muffler. The burned gas, on reaching the muffler is forced through devious passages and openings, which in effect breaks up the sharp staccato sound to a mere hissing sound as it leaves muffler outlet and passes into the atmosphere.

From the description it is readily seen that there is a large amount of back pressure present, which acts against the engine and is prevented from causing loss of power only by the closed exhaust valve during the suction and power stroke. If the passages in the muffler become choked or clogged from carbon deposits, the back pressure is further increased and will be noticed plainly as the engine tries to force the burned mixture into the exhaust pipe and muffler.

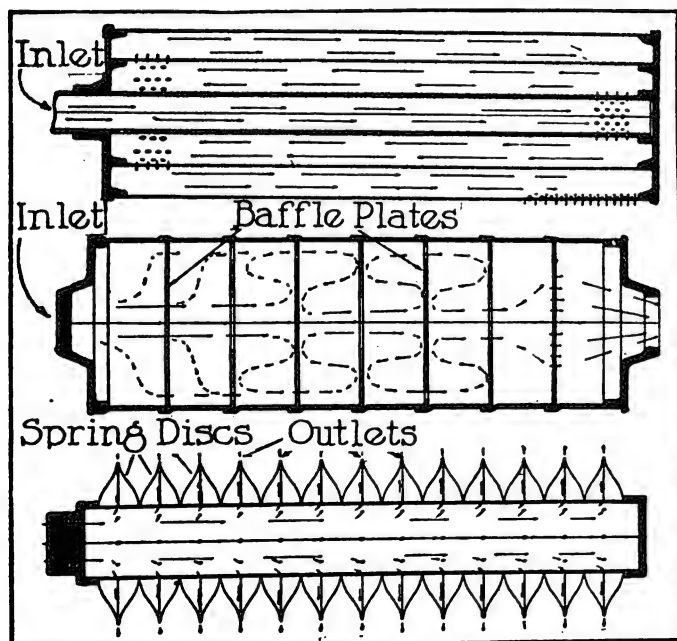
To know definitely that the muffler is causing the engine to lose power, one should test the various units of the power plant, eliminating those which are not working properly, until all have been eliminated, with the exception of the muffler.

As the muffler needs attention only at long intervals, it is least expected to give trouble and for this reason may be examined last.

Many Types of Mufflers in Use.

There seems to be no standard muffler in use, each separate muffler manufacturer using a type which he considers best, and selling it to the car manufacturers. Thus we find many types in use.

The Ford muffler consists of three cylinders lying parallel, spaced equidistant from one another by cast heads, which contain the inlet and outlet pipe connections, the heads and cylinders being tied together with long through bolts. The incoming exhaust gas travels through the central section to the cast head by which it is deflected through openings in the cylinders to the next parallel cylinder through which it passes to the opposite head, again being deflected through openings into the next cylinder, passing to the opposite head casting, and out through a small opening into the atmosphere. Carbon deposit on either the walls of the parallel cylinders, on the interior of the head casting, or in the opening between cylinders, has a tendency to prevent free passage of the gas and cut down the power of the engine. Removing the muffler, loosening the through bolts, separating the cylinders from the walls and passages will usually restore the original power of the engine provided the muffler is the cause of loss of engine power.



Three Types of Muffler (Used on Modern Cars), Which Serve to Show the Principles of Construction. Top—Parallel Cylinder Type. Center—Perforated Circuit Plate Type. Bottom—Circular Disc Type.

and being extensively used at present in a different design. With the increase in the number of engine cylinders, it proved necessary for the manufacturers to invent some method of silencing the noisy exhaust. Different types of mufflers were invented, some of which performed their work creditably while others had little effect on the noise.

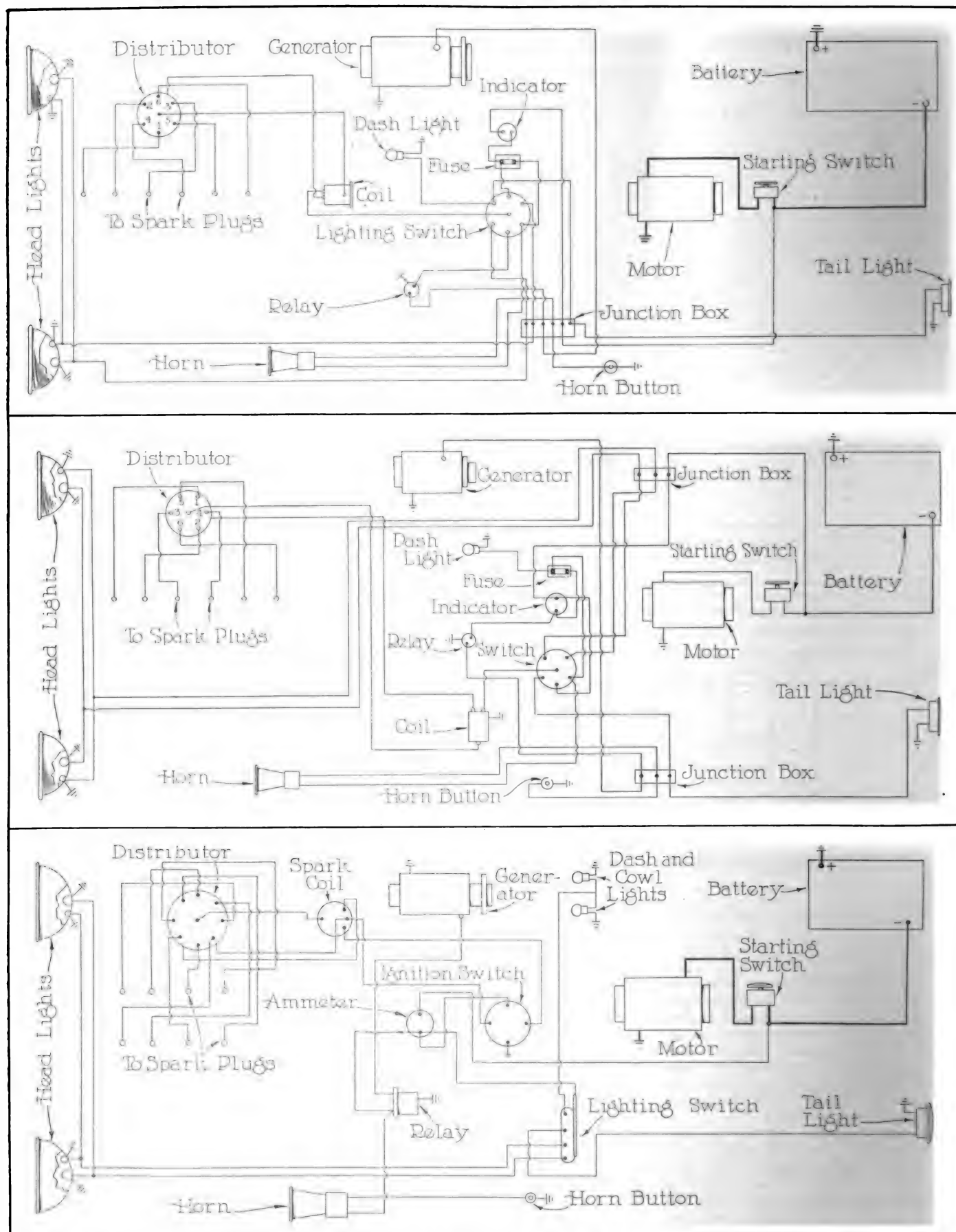
Early four-cylinder vertical engines lacked power for hill work, often due to faulty design, necessitating the use of a cut-out placed ahead of the muffler on the exhaust pipe, which would allow the exhaust gases to come directly into the atmosphere without going through the muffler. This increased the engine power for grades, often allowing the car to make hills on high that otherwise would

charge behind the bullet.

The engine exhaust is caused by the gas mixture formed of about 16 parts air to one part fuel, being compressed in the combustion chamber of the cylinder by the piston and ignited by the spark at the points of the spark plug. When the piston reaches approximate top dead center, the mixture expands with combustion, forcing the piston downward, imparting a turning motion to the crank shaft, which transmits the power through the clutch, transmission and propeller shaft to the pinion and large bevel ring in the differential, thence to the axles and wheels.

On the next return stroke of the piston the exhaust valve has been opened by the camshaft, allowing the piston to

Monthly Wiring Diagram, No. 26



Top—Elgin Model 17-1917 Six-Cylinder, Wagner Two-Unit Electric System, Single Wire, Circuit Breaker Separate. Center—Elgin Series H 1919 Six-Cylinder, Wagner Two-Unit Electric System, Battery Ignition, Single Wire, Separate Circuit Breaker, Two Side Junction Boxes. Bottom—Scripps-Booth Model D-8 1916 Eight-Cylinders, Wagner Two-Unit Single-Wire Electric System, Battery Ignition, Circuit Breaker Separate, Positive Terminal Grounded.

AUTOMOTIVE DEVELOPMENTS



Trailer Is Properly Attached, Preventing Any Lifting Tendency.

The Trailmobile

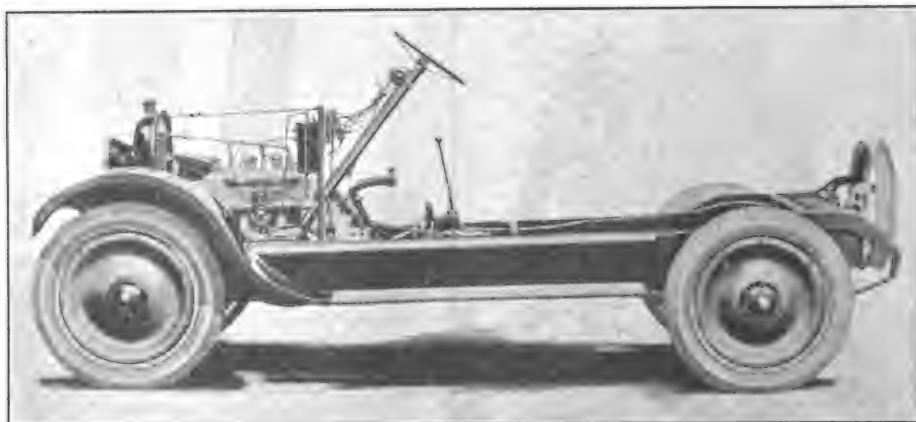
SPECIFICATIONS.

CAPACITY of Trailmobile 2½ tons. Made in two types, one having 22-inch wheels, the other having 32-inch wheels, making the measurement from the ground to the platform top 38 inches. Special bridge casting distributes approximately 30 per cent. of the trailer load to the hubs of the Fordson tractor, no weight being carried by the worm gear housing. Traction effort has been greatly enhanced by the proper distribution of the load carried and the large tires.

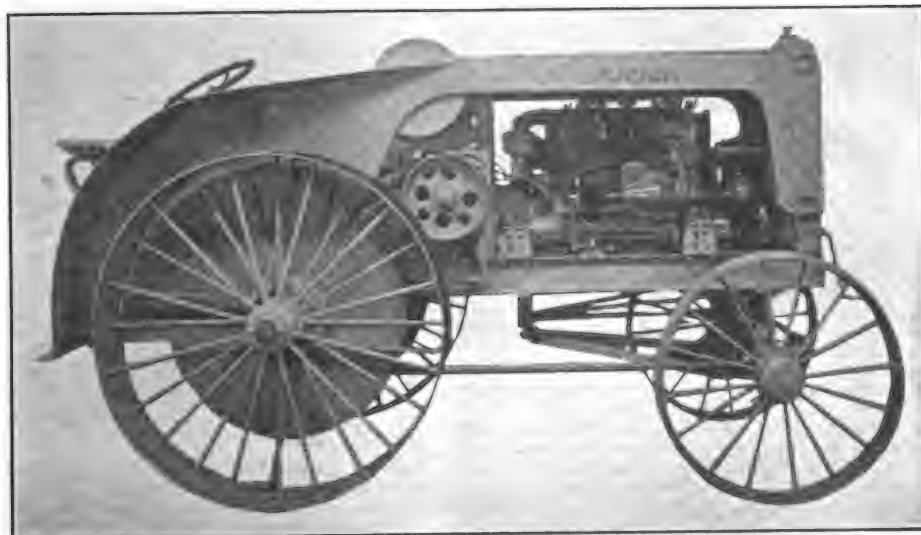
Reo Taxi Chassis

SPECIFICATIONS.

THE Reo taxi has a wheelbase of 113 inches. A four-cylinder engine having a bore of 4¼ inches and a stroke of 4½ inches is used. Selective type transmission and a dry disc clutch also are utilized. The rear axle is full floating and the steering gear is of the bevel gear and pinion type. Steel disc wheels and the standard starter used on the Reo cars for a number of years are regular equipment.



Durability Is Expressed in Every Line of This Rugged Chassis.



Accessibility Is a Prominent Feature of This New Leader Tractor.

Leader Tractor

SPECIFICATIONS.

THE new Leader tractor has a wheelbase of 76 inches. The diameter of the rear wheels is 54 inches, while that of the front wheels is 38 inches. The tractor weighs 5800 pounds and is equipped with a 14-inch auxiliary driving pulley. The transmission has two speeds forward and one reverse, the final drive being taken by a live rear axle 2 5/16 inches in diameter. Power is furnished by a four-cylinder Climax engine, having a bore of five inches and a stroke of 6¼ inches.

ACCESSORIES DEPARTMENT

The **Burke Grease Retainer** is so made that it will positively stop the leakage of grease on the rear axles of Ford cars, states the manufacturer.

This new retainer is as simple in construction as it is practical in use. It is made of accurately machined parts of bronze and steel, with a non-absorbent cork packing that insures a tight and permanent leak-proof job.

One of the features of the Burke retainer is the center bronze sleeve, which floats with the side play of the axle. Another exclusive improvement is the lug which fits the key-way of the wheel to



keep the sleeve turning with the axle.

With the use of this retainer the grease is shut within, not away from the bearings. It allows the differential gears and bearings always to be flooded with the lubricant, while at the same time keeping the brakes and tires dry.

It is easily and quickly installed. No special tools are required, nor does it in any way change the standard Ford construction.

All who have had any experience with this retainer say that it is practically the only device they have ever found that positively eliminates grease slinging on Ford cars.

It is sold by the manufacturers on an absolute guarantee that it will do the work regardless of the condition of the car on which it is placed.

Manufactured by the Burke Manufacturing Co., Dayton, O.

New Bergougnan "Gold Seal" Tire is the latest product of one of the oldest tire manufacturers in the industry and also a departure from the tread design hitherto used.

The manufacturer in announcing this new moulded casing wishes it to be known as the Bergougnan "Gold Seal" tire. It



will take the place of the former wrapped tread cord.

This new tire is presented by an organization with a record of 25 years of solid achievement, and as such merits consideration.

Besides the Trenton factory this company is said to operate plants in France, Belgium, Italy and Russia.

Manufactured by the Bergougnan Rubber Corporation, Trenton, N. J.

Jenkins Eight-Leaf Front Spring for Fords to retail complete for only \$3 is the newest addition to the famous Vulcan line made by the Jenkins Vulcan Spring Company, Richmond, Ind. This spring is known as No. 2010 and is plainly stamped with the Vulcan trade mark, carrying in-



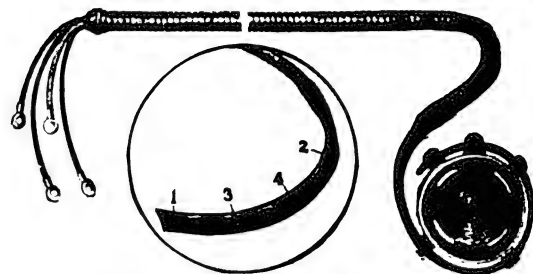
stant conviction as to its quality. It is interchangeable with the original Ford front spring without altering or substituting clips or shackles. While exceptionally low in price the manufacturer has provided a liberal margin of profit for the dealer on this item.

Manufactured by Jenkins Vulcan Spring Company, Richmond, Ind.

The "Popular" Timer Wire Assembly for Ford Cars is claimed to meet a long felt want among owners and drivers of this type of car, for an assembly that will furnish satisfactory protection for the wires from all water and dirt.

The illustration shows how the assembly is built up, of a flexible oil and water proof metal hose, encasing the four new

code insulated wires (250-volt underwriters' laboratories inspected) and having the usual spark coil terminals at one end. At the timer end the cords are enclosed in a fabric, the wires being permanently connected at the factory to eyelet terminals



spaced to fit the timer terminal studs. The fabric is treated and sealed by a special chemical process, making it absolutely impervious to the action of oil, water or dirt, yet leaving it perfectly flexible.

The overhead installation of the assembly is recommended as the best practise and is now generally used.

To install the popular timer wire assembly, simply remove the timer terminal nuts, slip the assembly eyelets over the terminal bolts in their proper order as shown and screw down the nuts.

It is claimed to outlast four or more ordinary loom timer wire assemblies, therefore gives more than double value, not counting time and money lost.

It is guaranteed for one year against break down due to oil or water by the manufacturer, Grigby-Grunow-Hunda Co., 900 W. Lake Street, Chicago, Ill.

Atlas Auto Ball Display Box is said to be meeting with considerable favor among the retail dealers, for a neat and attractive display of steel balls, for replacement in bearings of front wheels of Ford and Chevrolet cars.

This manner of display and systematic way of keeping these small parts should



meet a long felt want with the small dealer, also be a great help to stimulate business in these small parts.

Manufactured by the S. K. F. Industries, Inc., 165 Broadway, New York.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

"Red Devil" Socket Wrench Set is said to fit every bolt and nut on practically any car. It is called an excellent set for the average car owner who wants to make his own repairs and keep his car in good order. Sockets are of drawn pressed steel, thin for clearance, and strong enough for the hardest usage.

Each set contains the following: Unbreakable ratchet handle, long extension bar, short extension bar, universal joint, offset screw driver, 30 pressed steel sockets fitting hexagon nuts and bolts of the following sizes: 9-32, 5-16, 11-32, $\frac{1}{2}$,



13-32, 7-16, 15-32, $\frac{1}{2}$, 17-32, 9-16, 19-32, $\frac{3}{4}$, 21-32, 11-16, 23-32, $\frac{3}{4}$, 25-32, 13-16, 27-32, $\frac{3}{4}$, 29-32, 15-16, 31-32, 1, 11-16, $1\frac{1}{4}$, $1\frac{1}{2}$ inches; three pressed steel square sockets to fit $\frac{1}{2}$, $\frac{3}{4}$, 21-32 inch sizes, and one spark plug socket with 29-32 inch opening.

Manufactured by Smith & Hemenway Company, Incorporated, Irvington, N. J.

Everybody's Hawkeye Basket Refrigerator is built like a high-class refrigerator. The outside is rattan, next to this there are several layers of the best insulating material, and lined with tin plate with removable ice compartment. A small piece of ice keeps contents cool for 24 hours, it is stated. This basket is 20 inches long, 12 inches wide and 10 inches deep—light, neat and durable and shaped so that it can be placed under the robe rail in the tonneau of a car where it takes up little room and is within easy reach.

As it has an ice compartment which will hold ice to keep food cold, this feature will appeal especially to families



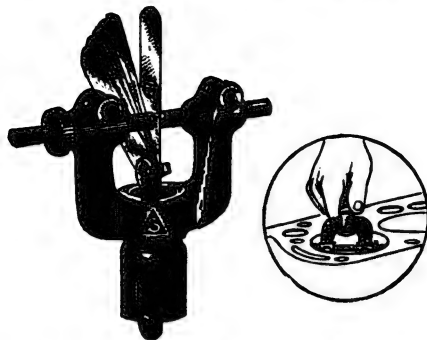
who must take along milk for the baby and keep it sweet and sanitary.

This basket refrigerator is dust and dirt proof and keeps out insects. Its popular price, \$6.50, has been made possible on this model only by the large manufacturing facilities.

Manufactured by Burlington Basket Company, Hawkeye Building, Burlington, Ia.

Stevens Cylinder Micro Gauge is said to be designed on a new principle, for every day use in the repair shop, and is claimed to be a very accurate and practical tool.

It consists of one fixed pin and one adjustable pin, mounted in a holder. The combined length of both pins, when butted together, equals the exact standard size of the cylinder to be measured (as in case



of a Ford they would measure $3\frac{1}{4}$ inches).

To measure the wear or oversize the operator unscrews the adjustable pin until the gauge fits snugly into the cylinder. The opening between the pins shows the over-size of cylinder. This opening can be measured with a thickness gauge. This Micro Gauge may also be used as a standard over-size gauge, by inserting the required blade of a thickness gauge between the pins, and fastening the adjustable pin. This gauge should meet with general approval among the repair shop men.

Manufactured by Stevens & Co., 375 Broadway, New York, N. Y.

The Any-Angle Vision Guard is claimed to prevent accidents caused by the blinding glare of head lights on approaching automobiles as the guard can be instantly adjusted to any position to stop the glare from any angle. The claim can be readily understood that it assures com-



fort with safety when driving, not only at night, but also against the sun. It is easily attached to the windshield.

Manufactured by the Em-an-Es Co., 1511 Bates Street, Indianapolis, Ind.

Sentry Signal is good in appearance and mechanically efficient in construction, with a good lens and reflector, a clever little switch for operating and is supplied with insulated stranded wire cable instead of solid wire. It shows its value in appearance and quality. It has a lens of brilliant red, of neat design, and with black that will not wear off. The water and mud proof switch is built to perform its function under all conditions, and the cable is of heavy, specially made, stranded, well insulated copper wire.

The patented "wonder lens" has the black burned in, and is made of a secret process glass, which, with light intensify-

ing concavities, produces night, day, sun and fog penetration of superior nature. A heavily silvered reflector and patented sure focus bulb socket and a genuine Mazda bulb aid in the above exclusive effect.



It is finished in velvet black, with nickel collar and rear cap and is intended for the "man who is willing to pay more money for more money's worth."

Manufactured by Protex Signal Company, Cleveland, O.

Speyer's "No-Skweek" is claimed to be "in the class with out of the ordinary spring lubricants," as it is compounded with a special oil scientifically prepared by the manufacturers that is said to pos-



sess exceptional penetrative power, allowing it to enter the most inaccessible crevices, working its way through any spring or part of the body within five minutes.

It is said to dissolve the rust on its way and lubricate the melted parts. It spreads in every direction, going upward as well as downward, and leaves a film of oil and graphite on every working part.

This combination of the special oil and defaculated graphite remains permanently when applied to the rusty part, acting as a lubricant, which is unsurpassed in its



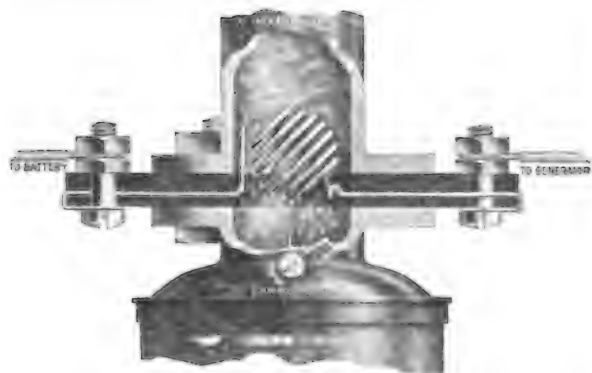
efficiency. It is also claimed that Speyer's "No-Skweek" applied to the springs will make the car ride easier and eliminates all possibility of the springs breaking on account of rust—also that a few drops will release rim bolts and nuts that are frozen with rust.

Manufactured by Speyer Manufacturing Corporation, 55 Hope Street, Brooklyn, N. Y.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

Romey Fuse Electrofler is claimed to increase gas mileage from 20 per cent. to 35 per cent., according to condition of motor during an average season's run of 7000 miles, or its equivalent mileage on other cars in similar proportion according to their make. The manufacturer claims to guarantee these statements and supports them by a forfeit of \$100, payable to any driver who can prove that these claims cannot be accomplished in moderate driving.

The Electrofler is installed between carburetor and manifold, connected in series in the charging line between the generator and battery. The peculiar construction of the instrument and the special alloy material used, make it possible and convenient to maintain continual red heat on the wire ball with surplus current of the generator when the motor is running and to charge battery at the same time. Due to the mounted position



ries in the charging line between the generator and battery. The peculiar construction of the instrument and the special alloy material used, make it possible and convenient to maintain continual red heat on the wire ball with surplus current of the generator when the motor is running and to charge battery at the same time. Due to the mounted position



of the wire ball it forms a screen effect, through which the fuel must pass, striking the red-hot wires and causing instantaneous transformation into gas ready for explosion under cylinder pressure.

Manufactured by the Bukolt Manufacturing Company, Stevens Point, Wis.

The **Basco Horn** presents quite a different appearance from the conventional horn motor design. The first impression is the very marked simplicity of design and small number of parts constituting it. Among the noteworthy features are oilless bearings and an entirely new type of brush holder construction. No lubrication of any kind being required the



troubles due to oil and grease or lack of them which are so often the cause of horn failures, are entirely eliminated. It is absolutely impossible for the brushes to stick.

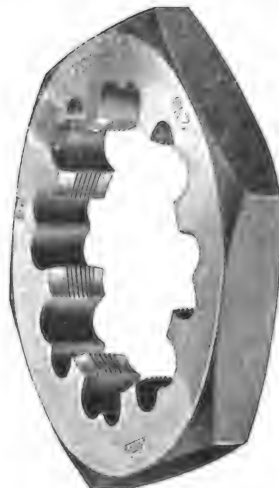
The Basco horn is equipped with a very high torque motor, which insures instant response to the horn button and gives a

very penetrating warning. External tone adjustment is provided.

Another important feature is that the entire horn, which consists only of five units, can be entirely taken apart and put together in five minutes and no tools are necessary but a wrench, as it is only necessary to remove two nuts.

Manufactured by the Briggs & Stratton Company, Milwaukee, Wis.

The **Special GTD "Hex" Die** is $2\frac{1}{2}$ inches diameter, 24 threads per inch, and it is made expressly for rethreading the threads on Ford hubs. It will be welcomed by repair men familiar with the trouble and delay caused by battered threads on hubs, either as the result of

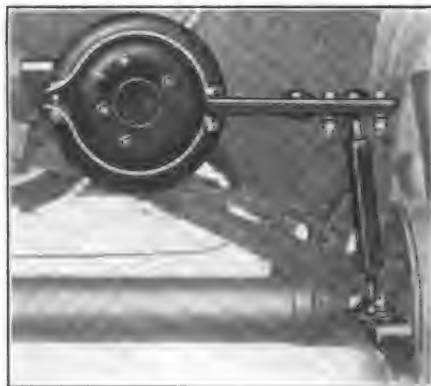


the owner's running into steps, telegraph poles, etc., or crossed threads due to careless assembly at some past time.

The price of these special dies is in line with the rest of the hexagon rethreading dies, which during the past year have proved a boon to garage mechanics all over the country.

Manufactured by Greenfield Tap & Die Corporation, Greenfield, Mass.

The **"Blackmore"** is a new and improved shock and roll preventer for Fords. This new device, according to the opinion of the officials of the company, marks a distinct advancement over anything else of its nature now on the market. It is an adaptation for Fords of a shock absorber originally designed and built for special equipment on one of the best known makes of large cars.



According to officials, all the unnecessary spring throw is prevented by slowing down gradually the forces of compression and rebound. Sudden severeness is toned down and almost eliminated, while the side sway and bumps are smoothed down to little or nothing. This is accomplished by an increasing friction with the up and down motion of the arm.

Besides wonderful shock absorbing ability, it was proven that the steady, checking influence of this new principle

(When Writing to Advertisers, Please Mention the Automobile Journal.)

is so satisfying that one does not recognize his Ford as being the same car.

Another point of merit is the ease and quickness with which this new device can be installed. Without any changes they are fastened easily and quickly to the present bolts on frame and axle, both front and rear.

It is stated that in the development of this innovation the inventor worked for years to develop the idea to practical mechanical perfection and as it is now produced the device has been subjected to every possible test, under any and every conceivable condition, on several makes of cars.

Manufactured by Charles C. Blackmore Co., Dayton, O.

The **Champion 78-DT Spark Plug** is designed specially to meet the conditions of the Dodge Brothers car. This is an AC Titan plug, which is slightly longer than the $\frac{7}{8}$ -inch regular plug and, it is stated, is used as regular equipment with all Dodge Brothers cars.

Among the list of plugs manufactured by this company will be found many special and regular plugs designed for use in practically all cars made to date, including



ing special plugs for the Ford and Fordson, long bodied plugs, metric sizes and aviation plugs. Many special features are found in these plugs, which recommend them for general use and have caused them to be accepted by engineers for use in cars, trucks and tractors.

Manufactured by the Champion Ignition Co., Flint, Mich. Prices and literature on request.

K-D Paralleled Jaw Valve Spring Lifter as the name signifies, is claimed to lift straight up. This feature eliminates all possibility of the washer or spring binding on or bending the stem and raising the valve. Another big feature about the tool is that two extra jaws are furnished with each K-D universal lifter. All jaws are removable and interchangeable by simply removing the fulcrum pin. Each



jaw has a different size opening and the combination of these sizes makes the tool adaptable to practically all sizes and types of motors.

The locking device is entirely between the handles and will stay locked in 11 different positions, and will hold the lifter in place when the spring is raised, allowing the operator to use both hands if necessary to remove or replace the key.

The locking device does not protrude through the handle to get in the way when in use. This lifter is not only adapted to removing valves, but with



these special patented features of construction is especially adapted to replacing them.

Manufactured by the K-D Manufacturing Company, Lancaster, Pa.

The Master Cylinder Reboring Tool possesses many features that are very interesting, as they facilitate the operation of reboring a cylinder, and enable the small garage or repair man to successfully compete with the more elaborately equipped shop at a very great saving.

The main body or housing of the tool is made in one standard size and adapted to be clamped or bolted to top or bottom of cylinder block as necessary.

The spindle is two inches in diameter and arranged with a taper at its lower end to receive any of the three different sizes of cutter heads, which range from 2½ inches to five inches in diameter, and receives its motion from a large worm gear.

The cutting heads are fitted with six concentrically adjustable cutters, that can be set to any desired size by means of the graduated wheel at the top; this wheel is graduated very plainly and arranged so that you can increase or decrease the diameter of the cutters to 1/1000 of an inch, and get any diameter desired in-



stantly without the aid of a measuring instrument. The driving wheel is fitted with a lever that can be lengthened or shortened as found necessary, and is geared to the spindle with a 5½ to one ratio worm gear drive, which will revolve the spindle 20 to 30 revolutions per minute. The shift pin at the top of body enables the operator to engage or disengage the feed gear at will; when disengaged you can slide the spindle up or down freely.

Manufactured by H. D. Taylor, 1744 Hubbard Avenue, Detroit, Mich.

The Red Hand Warning Signal is claimed to be one of the best devices recently put on the market to add to the great and varied assortment of rear end signals. This signal differs in a great many ways from the majority already on the market, not only the color, which is deep orange red, and is claimed to be the easiest color to see, either night or day, but also in the shape, the hand upraised in warning seeming to be of a character to carry its message instantly and unmistakably.

It attracts the attention of the man behind to the fact that the driver is going to either turn to right or left or stop entirely.

The manufacturer claims that the readiness with which this signal may be seen is due to a glass tube containing Neon, at

a pressure much below the atmosphere when subjected to static electric pressure, which makes the signal emit an orange red glow. This glow can be seen through fog and moisture and quickly

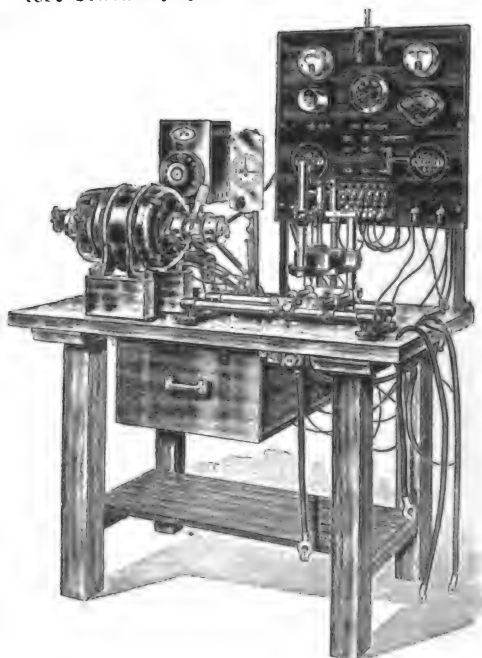


catches the eye. It is stated that the Neo-Lite signal will outlast the car, as it has no incandescent bulbs to burn out or filaments or mantles to break or replace. It is handsomely finished and adds considerably to the appearance of the car.

Manufactured by the Federal Signal Company, Albany, N. Y.

Test Bench equipment for making running tests on starters, generators, magnetos, distributors, etc., before and after repair is becoming more necessary with the automotive repair man. The test bench equipment enables him to determine the actual condition of the unit under test, as it may be expected to act on the car.

The average auto owner will more and more require service of this kind and it is only a question of a short time when every repair shop will have some kind of test bench equipment.



The automotive electrical service test bench is a new model with all the very latest improvements, which enables one to quickly determine any unit under all conditions which it may be subjected to. The adjustments on this test bench are all conveniently arranged to enable the operator to make proper connections and readings with practically no effort on his part.

Manufactured by P. G. Niehoff & Company, Incorporated, Ohio Street, Chicago.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

Lazear Silent Merchandiser is furnished in compliance with a general demand by dealers for an efficient means of demonstrating and displaying the Lazear lock steering wheel for Ford cars in their stores. The Lazear Products Company has designed a very attractive display stand that is proving unusually popular. It is said that the stand is really more than its name implies, as it is in fact an effective silent salesman.

It is made of polished cast aluminum attractively finished, the base bearing the



words, "The Lazear Lock Wheel Locks Without a Key." The stand is being sent free to dealers with their initial order for wheels.

Manufactured by Lazear Products Company, 557 West Quincy Street, Chicago.

The Glowrite Motor Clock is a radium-dial timepiece, made of nickel silver, which will not rust, tarnish or "spot."

Though it may be attached in a few minutes by means of three small bolts



and nuts—without cutting a large hole in the instrument board—it cannot be removed without taking considerable time and trouble—making it practically safe from theft. Mounted in a special vibration-proof case the works are protected from shocks. This clock sells for \$4. The Paramount, a trim silvered-dial clock, with numerals clearly outlined, is intended for the use of motorists who do little



or no night driving. Aside from the dial and a slight difference in shape, it is similar to the Glowrite in all respects. Its price is \$3.

Glowrite and Paramount Motor Clocks are manufactured and sold by J. F. Mansfield, 9 Maitland Lane, New York City.

The New Bong Battery is claimed to be built on a decidedly different principal of construction, a departure from the conventional design, although the usual lead elements with regular filler and standard electrolyte are used.

One of the main features of this bat-

tery is that it can be completely pulled down or all the elements removed or replaced by any one with nothing but an ordinary wrench.

What is called an improvement in design, but still embodying the

old approved elements, is said to allow the owner driver to make his own inspections and repairs.

The positive plate or element consists of a series of pencils, so designed that any one of which can be removed from its respective grid and replaced with a

The negative plate or element is built up of a series of grids or tubes in such a way as to make a cylindrical orifice into which the positive pencils are set; thus it can readily be seen, also by the illustration, that separators, in the ordinary sense, are entirely eliminated. The re-



tery is that it can be completely pulled down or all the elements removed or replaced by any one with nothing but an ordinary wrench.

What is called an improvement in design, but still embodying the

new pencil should wear or accident necessitate such replacement. These pencils are securely and electrically connected and locked in a positive position by an original idea so as to offer no resistance to the current.

placement of positive pencils requires only a few minutes and can be done by the owner.

Manufactured by the Bong Battery Corporation, 1475 Mead Avenue, Chicago, Ill.

New Johnston Visible Gasoline Filter for Stewart Vacuum Tanks is claimed to provide adequate means for filtering the gasoline before it enters the tank thus eliminating water, lint, grit and dirt. Whenever the hood of the car is raised a glance at the glass bowl readily shows whether it requires cleaning or not. It takes but a minute to dump the bowl as a few turns to the left on the threaded lock nut release it from which the accumulated dirt or water can be thrown out. This method of catching and stopping the cause of a whole lot of trouble, should provide a very practical and useful article, also make a good article for the jobber or

tank in the other opening of the filter arm above glass bowl and screws it down tightly so that it goes through hole in center of filter screen. Then screw the regular connection which, in most cases, is an elbow connection into the bushing. The filter is then ready for use.

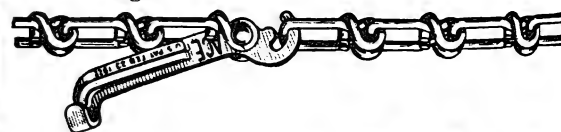
Manufactured by the Wm. R. Johnston Mfg. Co., 451-469 E. Ohio St., Chicago, Ill.

The Ace Non-Skid Chains present features entirely new, it is said. The cross chains consist of a center unit supplemented with side links and hooks to constitute different sizes to fit pneumatic tires.

face, slipping or skidding is almost impossible on wet or slippery pavements, while the inner surface is smooth and conforms to the tire, avoiding any possible injury thereto.

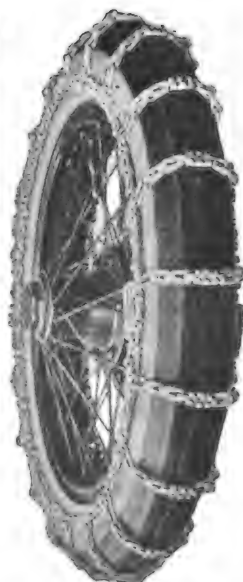


Unlike certain varieties with which most motorists are familiar, Ace cross chains are said to be made of solid, pressed, flat steel, cyanide hardened. The material, treatment and construction combine to effect the purpose of the chain—to insure safety, preserve the tires, give greater traction and increased mileage.



The Ace patent fastener permits the side chains to be drawn tightly around the circumference of the wheel (without the use of tools of any kind), holding the smooth inner surface of the cross chain close against the tire.

Manufactured by Ace Chain Corporation, 23 South William Street, New York City.

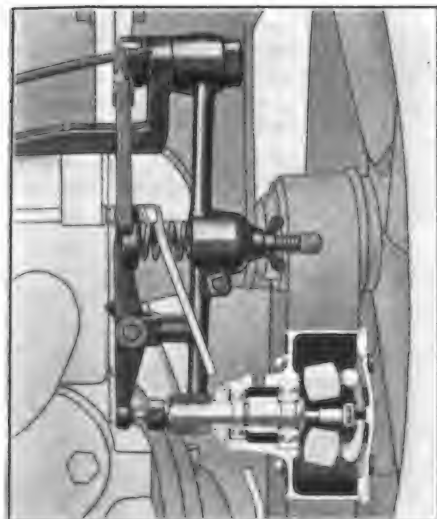


dealer to handle the coming year. This filter is made to fit the standard Stewart vacuum tank without any changes, and is a nicely made and a slightly article, very easily attached by disconnecting the main gasoline pipe at top of tank by removing elbow and bushing and attaching the small end of the filter arm by using hollow screw plug and two copper asbestos gaskets, which are furnished. In fitting, the operator places bushing removed from vacuum

The purpose served is that of presenting a sufficiently rough surface to the road as, each center link having teeth, thereby causing an effective gripping sur-

(When Writing to Advertisers, Please Mention the Automobile Journal.)

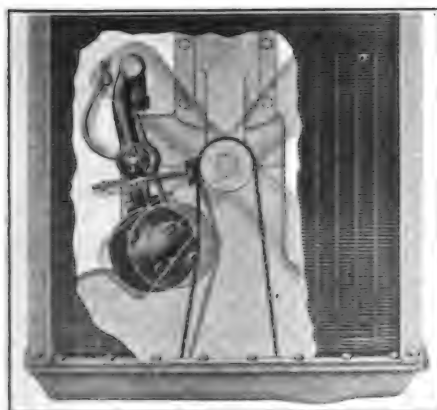
The Wehr Throttling Governor, just announced from the factory, has many absolutely new features which make it of extreme interest both to the Fordson dealer and owner.



One feature of the Wehr Throttling Governor is that it does not need an expert mechanic to install it. In fact, anyone can install this governor in less than 15 minutes. There is no necessity to re-time the motor, change the location of the timer, remove the regular Fordson butterfly valve or change the gas throttle or other levers. There are no holes to drill. All that is necessary is the loosening and tightening of two cylinder head cap screws when the governor is installed.

Another big feature of the Wehr Throttling Governor is the extremely low price. This governor sells retail for \$18.50 complete. It is made of the highest grade material throughout and the greatest care and engineering skill have been expended on the manufacture of it.

The governor is of the fly-ball type and operates on the same principle as the gov-



ernor on a steam engine. It gives extremely close regulation of the motor speed and effects surprising fuel economies.

Long and exhaustive tests have been made of this governor and it has satisfied all observers of its capacity for regulating motor speed without any noticeable variation.

Another big feature of the Wehr Throttling Governor is the fact that it acts as a fan belt tightener. The governor case forms the idler pulley, running against the slack side of the belt. The case is light in weight and runs in oversize ball bearings. Consequently it requires a very slight pressure against the belt to drive it. The tension of the spring holds the governor tightly against the fan belt and

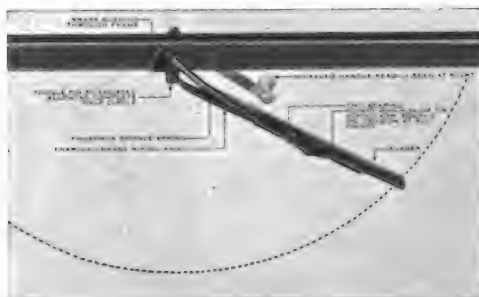
takes up the slack as the belt stretches. This prevents any possible slippage of either governor or fan. A water or oil-soaked belt would not affect the operation in any way and the governor prolongs the life of the fan belt.

The speed of the governor is one and a half times the engine speed. Regular Fordson fan pulley roller bearings are used, which are 50 per cent. oversized for the actual governor needs. This practically eliminates friction or wear. The governor case forms an oil reservoir, holding a week's supply at one filling and making an oil bath for all moving parts, which are enclosed in a dust-proof case. The operator regulates the speed by means of the regular gas throttle lever.

Manufactured by the Wehr Company.

Perfection Windshield Cleaner, durably made of brass in either nickel or black enamel finish, is proof against rust and will last longer than the car upon which it is installed it is stated. It does not require any holes to be bored in the glass, but is fastened securely in place through or clamped over the top of windshield frame. When not in use it is out of sight so that it never interferes with the vision of the driver.

The cleaning is done by a strip of live rubber which is held firmly against the



glass by a phosphor bronze spring in such a position that it cuts the rain or snow from the windshield instantly, in a full half circle. By a patented arrangement the rubber blade oscillates and slides in a channel piece, which is fastened to the spring arm, thus producing an even pressure at all points of the rubber as it travels across the windshield. This prevents the rubber from cracking and breaking.

The Perfection Windshield Cleaner is easy to operate, being light, well balanced and so mechanically perfect that it has been adopted as standard equipment by a number of manufacturers of high grade cars. Installed on any enclosed or open car it permits the windshield to be raised to a horizontal position without interference.

The Perfection Windshield Cleaner is made in two styles, single and double. The latter is especially desirable for enclosed cars where it is often necessary to clean the steam which gathers on the inside of the glass.

Once installed it is never necessary to remove the windshield cleaner. It is not only attractive in appearance, but is always out of sight and out of the way when not in use.

In every way it is a quality product—one that will give lasting satisfaction.

Manufactured by Perfection Sales Company, Sun Building, Detroit, Mich.

The Tiffany Parking Lamp fits flush with the fender and has the appearance of being "built into" the car. It is not an accessory, but a part of the car. The mounting screws and connections are concealed and there are no screws to rust and become unsightly.

Due to its rounded lines and low mounting it is not liable to be caught by passing objects. It has a readily accessible but concealed switch. A prominent switch

is an invitation to every passing boy to play with the lamp.

An especially attractive feature in the lamp is the very simple operation necessary to replace burned out bulbs. Instead of removing the two small lenses and placing the bulb through the small opening in the usual manner, bulbs are quick-



ly and easily replaced in the Tiffany lamp by merely snapping off the cover, which leaves the lamp socket fully exposed.

A "Standard two candle power six-eight volt," double contact bulb is used



and new bulbs may be purchased from any dealer or garage. The simplicity of the design is unique. It is ruggedly constructed throughout.

Manufacturing by Tiffany Manufacturing Co., Spring Street, Newark, N. J.

Elm City Terminal Outfits are made for the convenience of garage employees, storage battery man and wiring experts. The outfit consists of 1000 brasslets and an eight-inch nickel plated punch with knurled handles.

The operation is very simple as the operator just removes the insulation from



the wire, splits the ignition cable, twists wire around the brasslet and operates the punch. This outfit is a great time saver and fills a long-felt need in auto repair shops and factories.

Sold by C. S. Mersick & Company, 274-82 State Street, New Haven, Conn.

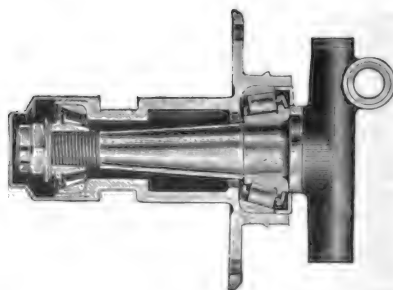
(When Writing to Advertisers, Please Mention the Automobile Journal.)

Gemco Baf-Oil Plugs form combustion chambers into which the spark plugs are screwed in the usual manner. In each chamber are two baffle plates, which prevent the oil from reaching the firing points. Each plug is a unit in itself and has no mechanical contrivance to wear out or cause trouble. Oil is prevented from reaching the firing points and is not burnt into harmful carbon.

A priming feature is included in the $\frac{1}{2}$ -inch size, which adds materially to its usefulness in cold weather.

The baffle plates prevent the oil from reaching the firing points and become extremely hot when the motor is in operation and act as hot spots which completely vaporize the gas, states the manufacturer. When the spark occurs the

load and thrust with the result that there can be no binding either when travelling straight ahead on a level road, negotiating turns at high speed or by end thrust, often resulting from the nature of the road.



$\frac{1}{2}$ Inch
Standard



PRIMING FEATURE



$\frac{7}{8}$ -18
S.A.E.

highly vaporized gas in the combustion chamber ignites and shoots into the cylinder proper, causing a clean explosion that increases the power of the motor and reduces carbon deposit.

The manufacturer states that there are more than 10,000,000 oil pumping cylinders that would be greatly benefited by the installation of the Baf-Oil plug.

Manufactured by the Gemco Manufacturing Co., Milwaukee, Wis. Price, $\frac{1}{2}$ inch standard, \$1; $\frac{7}{8}$ inch, \$1.25.

The F. and H. Taper Roller Bearings for Ford and Chevrolet front wheels are self-aligning, adjustable and permanent, the manufacturer states.

The efficiency of a taper roller bearing is largely due to the correctness of the taper and the angle of the several parts to properly distribute the load.

In the F. & H. roller bearing this problem has been worked out with mathematical accuracy. It is stated: Taper and center line of the rollers being designed to perfectly meet the requirements of

The cone and rollers are forged from high carbon chrome alloy steel bars slightly oversize, then heat treated and hardened in oil, giving a uniform hardness throughout. The roller separator is a high, carbon steel stamping of such design that the rollers are always held in correct positions and the bearings become self-aligning and are easily adjusted. The separator is complete in one piece, heavy enough to retain its form and holds the rollers in position on the cone even when the outer bearing cone is removed.

The drop forgings of high, carbon chrome alloy steel for the cone and outer ring are, after being thoroughly hardened, finished on micrometer grinders to mechanically perfect size and contour, thus giving a high finish of these vital parts which insures the maximum efficiency, it is stated, and the minimum of friction.

The rollers are interchangeable with the ball bearings supplied in Ford and Chevrolet front hubs without machining or modification of either bearings, hubs or axles.

Manufactured by Fulton-Houston Co., 1148-50 S. Michigan Avenue, Chicago, Ill. Price, set of four for two wheels, \$10.

The Gridley Piston and Piston Ring Machine may be used with either belt or electric motor drive, the latter being recommended by the manufacturer as the speed may be varied to suit conditions of work. Namco self-opening dies are also recommended where speed is essential, the manufacturer stating that as threading is best accomplished by using the self-opening die, because of its strength, simplicity and positive opening action. The fixtures employed for opening die threading and tapping are simple in construction and springs are not used for returning the tool to its reoperative position.

Namco collapsing taps range in size from $\frac{3}{8}$ inch to $7\frac{1}{2}$ inches and cover prac-



tically all needs of inside rethreading in the automotive industry, it is stated. Automatic taps are also made in the style known as the outside trip, which insures collapsing action at the required depth regardless of any irregularity in the chucking up of the work. The chief difference between the outside trip and the inside trip consists not in the principles of collapsing action of the trip proper, but rather in the exterior design, which is

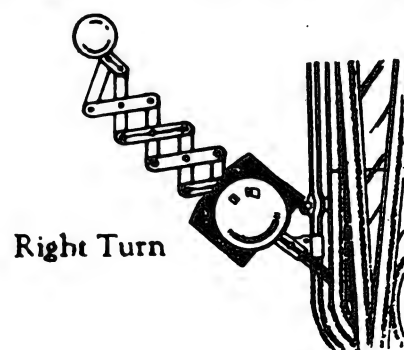
governed by the classes of work done and the kind of machine to which the tap is applied.

The Gridley single spindle automatic lathe is completely equipped with the necessary tool holders, slides, forming tool holders, cutting off tool holder corner stop, complete outfit of cams for medium and coarse feeds, etc.

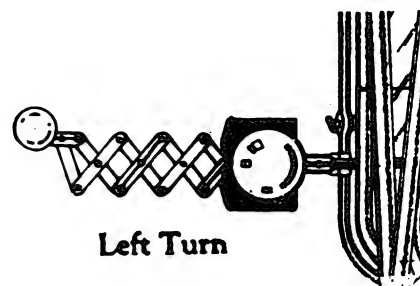
The Namco self-opening die head is an extra which is furnished on order, making the lathe and its attachments fully automatic.

Manufactured by the National Acme Co., Cleveland, O. Prices and literature on request.

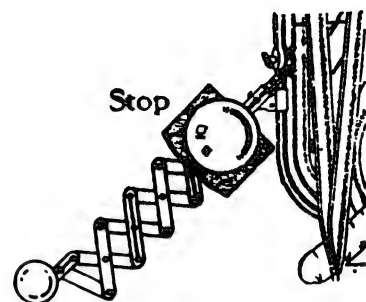
The Wolter Auto Signal is designed to protect the car and its occupants from accidents and collisions at all times and more especially, when the car is curtained or enclosed. This signal gives the driver of an approaching or following car detailed information of your intentions. If one intends to turn to the right the signal points upward; to the left, the signal



Right Turn



Left Turn



Stop

points to the left and if one intends to stop, the signal points downward. The signal, it is stated, is easily visible at all times at a distance of 150 to 200 feet. At night the signal is illuminated by a small electric bulb enclosed in the arm. A ratchet located six inches from the steering wheel operates the signal which is easily installed in a few minutes time by anyone handy with tools.

Manufactured by the Wolter Auto Signal Co., 2809 Rucker Avenue, Everett, Wash.

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TRADE OUTLET

TOLMAN MFG. Co.

MANUFACTURERS OF

WELDING & CUTTING



APPARATUS

19-21 THIRD ST.
BOSTON

SALESMAN for the best make Truck Tire Chain. A fast seller. A big profit for you to represent us locally. Write for agent's circular. HERMAN CHAIN CO., 1212 H St., Washington, D. C.

WANTED—High grade salesman to call on the jobbers of the country with a high grade line of All-Steel Bodies for trucks and Ford roadsters. The N. G. V. Company, Gallon, Ohio.

AUTO SAVE 50-90% PARTS

POPE, PACKARDS, PIERCE, BUICK, STEVENS-DURYEA, KNOX, OVERLAND, ETC.

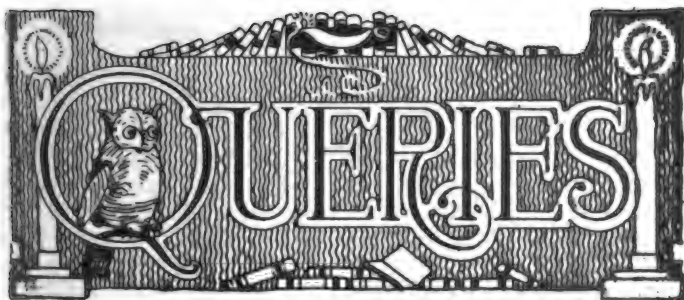
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| Motors, \$25.00 up | Presto Tanks, \$4.50 up |
| Magnetos, 4.00 up | New Spotlights, 2.00 up |
| Carburetors, 8.00 up | Generators, 10.00 up |
| Rear Axles, 15.00 up | Gears, 1.00 up |
| Front Axles, 5.00 up | Bearings, 1.00 up |
| Cylinders, 5.00 up | Radiators, 10.00 up |

\$12 Diamond Bumpers.....\$5.50
Jobbers in Bankrupt Auto Supplies.

BRIGHTMAN AUTO EXCHANGE

321 Windsor Ave., Hartford, Conn.

SIMPLEX STARTER \$20
Attach it yourself to Ford Auto. Guaranteed. Agts. wanted. American-Simplex Co., Anderson, Ind.



TWO UNIT SYSTEM.

(N. A. G. Montgomery, Ala.)

Would you please explain in your columns what is meant by a two unit system when speaking of the electric system of an automobile? Can the loss of mileage and power when using some makes of gasoline be caused by water being present in the fuel? Just what makes such a difference in the kinds of gasoline?

The expression, "a two unit system" means the installation in a machine of both a battery and a generator. The battery is a unit and the generator is a unit also, thus we have the two unit system. However, do not confuse this expression with that of "two point ignition," as the latter expression means an ignition which supplies a spark at two points in the combustion chamber.

The loss of mileage and power may be attributed to many reasons and circumstances, but if a person buys a gallon of gasoline and gets gasoline he cannot attribute the loss of mileage to water. Gasoline and water will not mix and we know if water is supplied to the engine it will not have less power—rather, it will have no power—and will cease to run unless it is supplied quickly with the proper fuel.

The loss of power and mileage can be attributed to a poor grade of gasoline, for comparatively the same reason that T. N. T. has more power and will throw a shell farther than ordinary black powder, i. e., specifically—a quicker expansion of its gases when released by the process of combustion. The reasons for the difference in grades of gasolines can be assigned mostly to the methods used in refining. The distillate from the crude oil is designated by different trade names, such as benzine, gasoline, naphtha and kerosene.

The better and finer grades of the gasoline used in the

(When Writing to Advertisers, Please Mention the Automobile Journal.)

The EARL MOTOR CAR \$995



F. O. B. JACKSON

EARL MOTORS, Inc., Jackson, Mich.
CANADIAN EARL MOTORS, Ltd.
BROCKVILLE · ONTARIO

automobile are the result of careful refining, while the poorer grades are the coarser products produced or the result of poor refining.

BROKEN SPRING.

(Topeka, Kan.)

Broke a spring on my car late last fall; had it repaired by a country blacksmith and have broken several other leaves of same spring, since which same blacksmith has repaired. Am a letter carrier, covering many miles of rough going.

When a spring leaf breaks, it is important to have it either repaired or replaced at once by a skilled spring maker, not by any chance blacksmith. Often a break in a leaf occurs at a place where it does not immediately cripple the entire spring, but it is obvious that the breaking of one leaf throws extra work on the remaining leaves, which may in turn suffer breakage, or the leaf replaced may be of different strength and resiliency than the other. If the intermediate leaves should break at the center bolt, the spring clips should be tightened down until it is possible to have the break repaired. Very often rebound clips are loose or broken. Missing rebound clips may also result in broken main leaves. Our advice is that you get an entirely new spring, although a second-hand one would probably do as well. Next time go to a spring maker if possible and get a leaf inserted of a strength and resiliency equal to the other leaves.

Clean Cutting

You want reamers that will do a lot of cutting—and do it fast. But you must have reamers that will cut clean.

When you get SUPER-SIX Expansion Reamers you've settled the reamer question all 'round. SUPER-SIX Expansion Reamers won't chatter, jam or gouge the work. They cut cleaner, faster and

Last Longer, too

Overlapping sizes and extra expansion permit more regrinding—longer life—less blade replacements. Made in sizes ranging from 15/32" to 1 25/32". Write for illustrated price list.

Cutter & Wood Supply Co.
274 Friend Street
BOSTON, MASS.



USE SUPER-SIX EXPANSION REAMERS

118-55

COES *The Standard* WRENCH



WRENCHES that are made for the hardest service. They do not break but grip and hold and their efficiency never lessens.

Economy tools as they last longer, give better service and never become useless through wear.

Utility wrenches of the highest order for car owners and repairers as they can be used in compact places and once set hold like a vise.

*The Best Wrench
The Cheapest*

All dealers carry in stock the exact size to meet your need. They recommend Coes Wrenches as all good dealers have for more than fifty years.

COES WRENCH COMPANY
WORCESTER, MASS.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

DRAWING OFF THE COOLING WATER.

(C. E. H., Westerly, R. I.)

I recently purchased a new car and I naturally desire to keep it in the best mechanical condition possible by giving to it the care and attention a machine requires.

There seems to be diverse opinions as to the necessity of drawing off the cooling water. Some automobilists claim the water should be withdrawn at frequent intervals. Other enthusiasts caution me not to withdraw the water except when absolutely necessary.

In your opinion what is the proper practise and why?

There are few automobilists that seem to realize how important it is to change the water in the cooling system every week or two. If this is not done the rust will accumulate and if allowed to remain in the system long it collects in masses and gradually fills up the water jackets. In time the cooling water cannot reach the bottoms of the jacket and the engine will overheat very readily.

For this reason I suggest you change the water in the cooling system at least once in every two weeks. It also is good practise at regular intervals of two months to dissolve two pounds of common washing soda in three gallons of water. Make enough of the solution in this proportion to fill the radiator completely. The solution should be used hot, as the results obtained are much better from hot soda water than cold.

If the cooling system has a pump, allow the engine to run about 10 minutes. The solution then should be drained and the radiator filled with clear soft water. If this process is conscientiously carried out you may feel that the cooling system of your car will not give you trouble.

GENERATOR WILL NOT CHARGE.

(F. E. S., Houston, Tex.)

I recently replaced the brushes on my generator by new ones I bought from an accessory store at a low price. Since the time I installed these brushes the generator fails to keep the battery charged. The ammeter never shows more than four amperes, no matter how fast the engine runs. When driving along at about 12 or 15 miles an hour the ammeter shows a discharge all the time. The brushes seem to be in good condition, although they were of the "cut price" variety. Can you suggest some way to get better results from the generator?

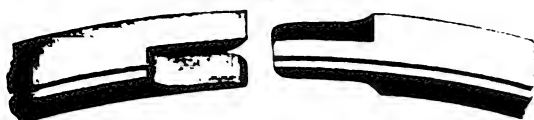
A careful analysis of your trouble suggests that the defect is not in the generator, but is caused by inferior brushes. With the above suspicion in mind I recommend that you procure a set of genuine brushes from the manufacturer of the generator or from some dependable dealer and install them. The installation of electrical brushes requires a great deal more than the mere placing of the brushes in the brush holder. They must be sanded in carefully by placing 00 sandpaper between them and the commutator (sand side to the brush) and drawing it back and forth until a perfect bearing is obtained for the brush on the surface of the commutator.

In order to make the sanding process more rapid a slight pressure may be brought to bear on the brushes, thus increasing the cutting power of the sand. Not only must this be done at the time of installation, but the third brush must be sanded in every time it is moved for the purpose of regulation.

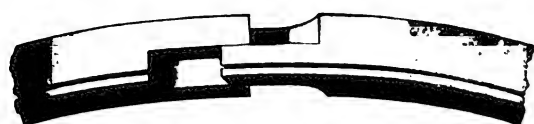
The cutout should be closed at a car speed of from 10 to 18 miles an hour, or an armature speed of 550 to 600 revolutions per minute. Immediately upon the closing of the points the ammeter should show a reading of 1.5 amperes charge. The points should open when the meter shows one ampere discharge. In testing the generator on the bench as a motor the generator should take 2.7 amperes at an armature speed of 450 revolutions per minute. If the field windings are normal they will pass 1.7 amperes when tested with a six-volt battery. I would suggest you make the foregoing tests if possible. At the same time dress up the armature, undercut the insulation of the commutator and polish with fine sandpaper. To increase the charging rate the third brush should be moved in a counter-clockwise direction when looking at the generator from the commutator end.

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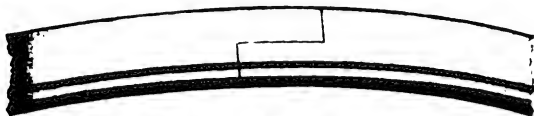
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QUICK SEATING TURNED FACE. Fine lathe turning produces a velvet face that will seat faster.



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—thus one size *Everyday* will fit a range of diameters that would require three sizes of any other ring.

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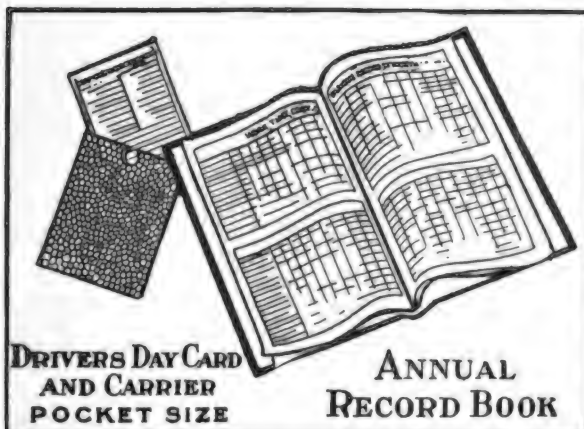
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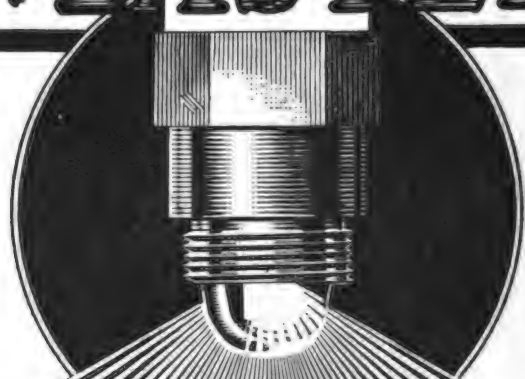
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This same care of selection should be exercised by every Jobber and Dealer, to make certain the final consumer secures better values and better satisfaction.

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THE *Piston* RING COMPANY
MUSKEGON, MICH.

THE AUTOMOBILE JOURNAL

VOL. LXIX.

PAWTUCKET, R. I., MAY, 1922.

NO. 9.

Who Wins?

*Indianapolis Speedway Again the Cynosure of All Eyes
as Speed Demons of Two Continents Prepare
for Tenth Annual Battle.*

(By STEVE HANNAGAN.)

WHEN starter Eddie Rickenbacker waves his red starting flag from his lofty perch on the bridge across the barrier for the flying wedge of drivers on the first lap of the Tenth International 500-mile race Tuesday, May 30, the eyes of the entire civilized world will turn to Indianapolis, the home of the world's most successful race course, as well as the

greatest racing plant in the universe. It will be a race to the finish with the crack drivers of two rival continents battling for a motoring supremacy which Europe holds by a score of five to four in nine years of International competition on the great 2-1-2-mile-bowl of bricks at Indianapolis, but which America hopes to even up with a third consecutive, complete Yankee win.



Who Wins?

IT IS authentically estimated that 150,000 people will watch the race from the grandstands, which loom up like giants along the home straightaway, stretching around the first turn and from the infield where 10,000 automobiles and a smattering of airplanes will be parked.

Indiana makes it a gala event that would put the Roman Holiday of yester age, with its chariot race thrown in, to shame for being a county fair hippodrome affair.

"It will be the greatest race ever." If the speedway press agent made

that remark it would be branded as out and out publicity, but that is the comment of the famous drivers themselves. Their preparation makes it evident that it will be the race of the century, with speed and thrills enough to last an entire year.

Drivers are switching cars with a reckless abandon that indicates they mean important business in the coming event. They are attempting to get the fastest creations and are in the market for every possible advan-

tage before rolling to the tape. It is predicted that more cunning and strategy will be exercised in the May drive than ever before — this, because several of the better cars will lack an advantage of super-speed over other mounts and it will be up to the drivers themselves to supply the gray matter necessary to bring the lifeless mechanical steeds prancing across the finish wire to victory. Wits, courage and daring will, undoubtedly, play a leading



—May 30th Tells the Story.

role. Heroes will be made and stars crushed, for the goddess of speed pays no patronage to the heavy hearted, light footed sons of racing.

Hearne Out to Win.

EDDIE HEARNE, the battle scarred youthful veteran of more speed duels than the average high school student of today can count will drive car No. 1, the Californian being the first to enter, with his Disteel-Duesenberg.

Chevrolet Enters Six Cars.

LOUIS CHEVROLET, who with his right hand bower, C. W. Van Ranst, engineer, designed and built the two cars which have won the past 500-mile encounters, has entered six Frontenacs in a most determined effort to annex the honors for a third consecutive time. He has named as his pilots Roscoe Sarles, who is jumping the Duesenberg outfit to return to his first loves—Chevrolet and the Frontenacs, and who is considered the ace of the Frontenac team because of his sensational rise to the top of racing with a heavy foot and a bag of driving tricks.

Ralph Mulford, the smiling parson, who has driven in every 500-mile dash; E. G. "Cannonball" Baker, who has made 52 transcontinental record breaking tours and who is now riding a motorcycle from Los Angeles to New York City to get in trim for the long Indianapolis grind; Peter De Paolo, nephew of Ralph De Palma, who is out to beat his illustrious uncle at his own game, and Art Klein, familiar for years in racing—that makes five, and the sixth probably won't be named until the start of the race. Chevrolet will have several relief drivers and he is leaving one car open for the man who will show the most aptitude between now and race time. It is known he is casting well defined glances on a certain dirt track speeder who has come into great prominence, but who has never appeared in an Indianapolis drive.

Goux to Be Reckoned With.

JULES GOUX, the Frenchman, is bringing Ballots over the big drink in an attempt to stem the

Here's Your Chance to Pick the Winning Driver

OFFICIAL ENTRY LIST INDIANAPOLIS MOTOR SPEEDWAY'S TENTH ANNUAL 500-MILE INTERNATIONAL SWEEPSTAKES, TUESDAY, MAY 30, 1922.

| Car | Driver | Entrant |
|----------------------|--------------------------|----------------------|
| 3 Disteel Duesenberg | Eddie Hearne | Disteel Flyers, Inc. |
| Frontenac | Roscoe Sarles | Louis Chevrolet |
| Frontenac | E. G. "Cannonball" Baker | Louis Chevrolet |
| Frontenac | Peter DePaolo | Louis Chevrolet |
| Frontenac | Art Klein | Louis Chevrolet |
| Frontenac | Ralph Mulford | Louis Chevrolet |
| Frontenac | Unnamed | Louis Chevrolet |
| Not Named | Tommy Milton | Tommy Milton |
| 8 Leach Special | Frank Elliott | Ira Vail |
| Frontenac | Unnamed | Mrs. Mae Harvey |
| 2 Duesenberg | Harry Hartz | Harry Hartz |
| Ballot | Jules Goux | Jules Goux |
| Ballot | Not Named | Jules Goux |
| Peugeot | Howard S. Wilcox | Howard S. Wilcox |
| Duesenberg | Wallace Reid | Wallace Reid |
| 4 Duesenberg | Ralph DePalma | Ralph DePalma |
| Fronty Ford | Jack Curtner | Jack Curtner |
| Fronty Ford | C. Glenn Howard | Chevrolet Bros. Co. |
| 7 Duesenberg | I. P. Fetterman | I. P. Fetterman |
| Bentley | W. Douglas Hawkes | W. Douglas Hawkes |
| Duesenberg | Jules Ellingboe | Jules Ellingboe |
| 4 Duesenberg | Jerry Wonderlich | Jerry Wonderlich |
| Monroe | Wilbur D'Alene | Monroe Motors Co. |
| 7 Monroe | Tom Alley | Monroe Motors Co. |
| Monroe | Lora L. Corum | Monroe Motors Co. |
| D'Wehr | Frank Davidson | Frank Davidson |
| 11 Duesenberg | Joe Thomas | Joe Thomas |
| Duesenberg | Unnamed | O. A. Hoffman |
| Bentz Special | Wm. H. Gardner | Wm. H. Gardner |
| Mystery Car | No Name | ..... |
| Durant Special | R. C. Durant | R. C. Durant |
| 5 No Name | James Murphy | James Murphy |

American victories. Goux is the first of the foreign invaders who won at Indianapolis, breaking up the two straight Yankee wins by his victory in a Peugeot in 1913 and starting a string of foreign wins that lasted until 1920, when the late Gaston Chevrolet won in an American car. Goux has not named the driver for the second Ballot, although it is confidently expected that he will choose a Yank, as he did in 1919, when Howdy Wilcox, an Indianapolis driver, went across the tape first for the Peugeot team, of which Goux was then captian.

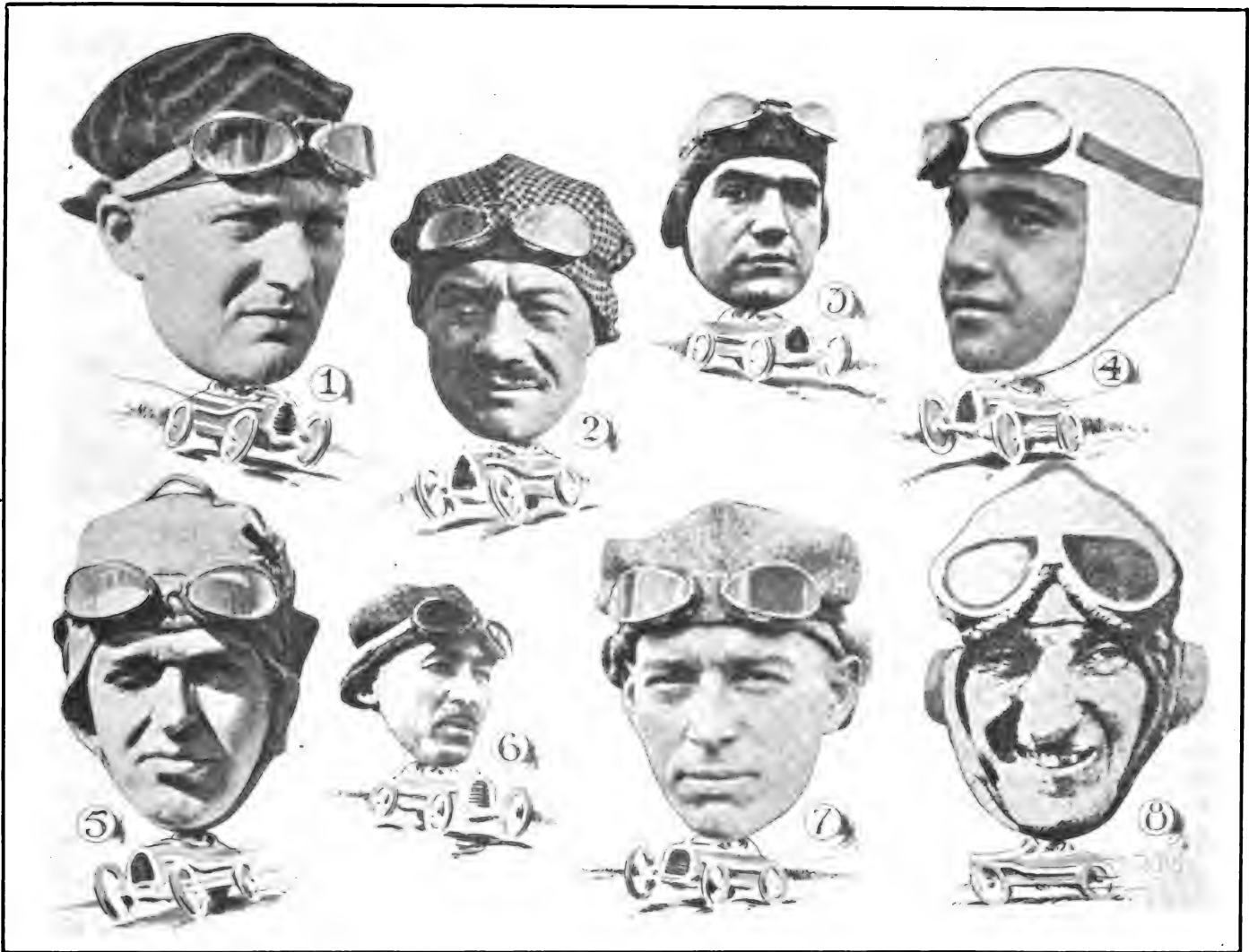
It is said Goux tried to get Wilcox to drive with him again this year, but Wilcox is satisfied with the Peugeot he has entered and which he has been tuning up for months. He hopes to repeat his performance of 1919, for after two years of dropping out early in the race because of mechanical troubles, he says: "If the car isn't in good shape to go 500 fast miles I'll never

take it out of the garage race day."

De Palma Has Duesenberg Mount.

JUST what Goux will be able to do with the French Ballots will be watched with interest, for it is the car the famous Ralph De Palma rode for two years without any bragging success, only to discard a few weeks ago in preference for a Duesenberg, which he will drive at Indianapolis.

The Duesenbergs have never finished higher than second at Indianapolis and it was Roscoe Sarles, who has just switched to Frontenac, who accomplished that feat. But they are making a strenuous effort to grab the event this year and their belief is that if they can let De Palma hop the car up a few miles an hour faster than the other jobs, as he has always done with his cars, without sacrificing any of the endurance capabilities of the car as demonstrated in Sarles' drive and Jimmy Murphy's grand prix victory in France last July, that the "hard



1. Howard Wilcox. 2. Roscoe Searles. 3. Ralph DePalma. 4. Peter De Paolo. 5. Tommy Milton. 6. Jules Goux. 7. Eddie Hearne. 8. E. G. "Cannonball" Baker—A Few of the Possible Winners.

luck" Italian pilot can ride in a winner.

Wally Reid, a movie star, has legitimately contracted with the Duesenbergs for a car to drive. He has obtained his Three A driver's license and badge and has officially placed his entry and entrance fee with the speedway management. He has driven with the various drivers while appearing as the hero in several moving picture races which has been written into his scenarios.

Tommy Milton After Win.

TOMMY MILTON, world's speed king, 1921 A. A. A. points championship leader, winner of last year's classic and possessor of a score of other titles and monickers, will again drive. He has selected his car and it is now being built on the coast. However, he has not yet named it and probably won't until a few days before the race. It

is said to be a duplicate of the motor he has been winning with so consistently on the Pacific coast during the winter racing season.

Will Jimmy Murphy Show 'Em?

JIMMY MURPHY is jumping the Duesenberg outfit with which he has been identified so long to drive a new car, also to be propelled by a coast-built motor. He will not divulge the name of the car, but ad-

vance information is that the popular young driver will have it plenty fast.

Harry Hartz, a youngster with but four races to his driving credit, but who distinguished himself as a comer by winning the 150-mile Easter day event at San Carlos, Cal., from Murphy, Searles, Klein and other stars, will make his first start at Indianapolis, at the wheel of a Duesenberg.

Jules Ellingbee, third last year in a Frontenac, has gone with the Duesenbergs, and Joe Thomas, I. P. Fetterman and Jerry Wonderlick will also drive Duesenbergs. But there will be no semblance of team management. Every driver is out for himself.

Ira Vail will drive a mystery car, while Jack Curtner and C. Glenn Howard will drive Fronty-Fords equipped with wireless telephones for messages from pit to cars.

COSTS LESS TO OPERATE CARS THIS YEAR.

THE Cleveland Trust Company estimates that it costs more than one-third less to operate a car today than it 'id a year ago. Gasoline is down 33 per cent, tires 38 per cent. and oil 43 per cent.

Durant Adds Sport Roadster.



This Sport Roadster Is Constructed on the Standard Durant Four Chassis.

TO the line of Durant automobiles there has been added a Sport Roadster, constructed on the standard Durant Four chassis and definitely suggesting the Spring joys of country club and open road.

It is the newest Durant creation, and is now on exhibition at different showrooms.

A notable feature in the new car's design is the size and utility of its rear compartment. It will close easily over two well-filled golf bags. It would accommodate a small trunk, or the usual gear of a camping tour. But with all its capaciousness, it does not interrupt the graceful sweep of the stream line nor give surface indication of its size.

The Durant Sport Roadster is a two-passenger car with racy sweep-

ing lines and an unusual amount of leg room. The model on display is dark blue with the characteristic Durant striping.



A Notable Feature of This New Car Is the Large Rear Compartment.

Invents New Engine.

"HARRY H. ELMER, former Pope Motor Company executive, more recently general manager of the Haynes Motor Car Company, identified at one time with the Grant Six, and now treasurer and general manager of the Globe Malleable Iron and Steel Company of Syracuse, is said to have invented an automobile engine that will travel 300 miles to the gallon of animal oil, vegetable oil, lard oil, neats foot oil, fuel oil, castor oil or 'anything that will flow and create expansion,' states a recent report.

"IT IS claimed that this engine has been viewed by such engineers as John Wilkinson, inventor of the Franklin air-cooled automobile engine, government experts of note and engineers from the various steel companies, and that none of them have found a flaw in its marvelous construction and equally marvelous operation. This engine can't freeze, has no carburetor or magneto, costs to build about half the price of a modern gas engine, and weighs a whole lot less than anything on the market.

"The details of this remarkable invention were revealed at a meeting of the board of directors of the Globe Company, who, after they had seen several full-sized engines operating, immediately appointed a committee to arrange for immediate development of the machine. Experts have declared the invention is a 'hundred years ahead of the times.'

"According to report Mr. Elmer has said that the new engine will run an automobile of middle weight type from 250 to 300 miles on one gallon of the 5½-cent fuel, and that the type to handle the heaviest work will weigh only about 325 pounds.

"He states that he got the idea from the experiments that the government was making during the war to get nitrates from the air. When convinced of the practicability of the idea he made drawings and had the engine assembled. He then cranked it over and away it went—so successfully that it scared him. He kept the secret, fearing he had only struck a freak, and made a duplicate. This one also functioned properly. He has made several, and not one of them but has started up as soon as it was com-

pleted and cranked.

"This new engine burns 36-40 gravity oil, the same as is used under forge fires, and it is built almost entirely of steel. It weighs only about one-quarter to one-third the poundage of a gasoline engine

POWER FURNISHED BY "SPLITTING OIL."

"WATER doesn't bother it at all,' said Mr.

Elmer. 'In experiments we played a hose on it, dousing it all over for 15 minutes and it continued to run without a stop. We threw snow into the intake, and it ate it up like so much air. The principle on which it operates is really splitting oil. As it runs it splits each drop of oil into 20 parts.

"For purposes of comparison Mr. Elmer was asked the cost of producing an automobile engine similar in power to that used in a well known small car. 'About \$60 in thousand lots, less perhaps in larger quantities,' the inventor replied, also stating that a gallon of crude oil would run such a car a month as the ordinary owner uses it.

and it will run on almost anything that will create expansion.

"Mr. Elmer found by actual test that the engine will run with castor oil, so cut with alcohol that it will emulsify with water. It ran perfectly, not only one, but three of the models that were made, on a solution of 60 per cent. water, 15 per cent. denatured alcohol and the balance castor oil.

"It develops a part of its extraordinary power through the fact that as the piston recedes, power accumulates. In fact, the power is such that the designer has found that it is necessary to open wide the exhaust to relieve the engine. But the engine isn't dangerous. It is so safe that it can be set up in a wooden building and the underwriters will pass it where they wouldn't even allow a gasoline engine, no matter how high the rate, according to a statement attributed to Mr. Elmer.

"About the only thing that will not run the engine is gasoline, and Mr. Elmer says that this is because the new engine is an expansion and not a combustion type.

"It's really a simple thing,' said Mr. Elmer. 'So simple that for years inventors and others have stumbled over it,' and when he had the idea and found that it would and does actually work, it surprised him greatly. And thus far, although he has tried every known test, the engine has kept right on running, even when it has been showered with water from a hose. Its possibilities are unlimited, and he is determined that nothing shall keep its benefits from the public. Incidentally, there will be no stock for sale according to Mr. Elmer.

Bearings and Their Renewal

Detailing Proper Overhaul of These Important Units
From a Practical Standpoint—Also Describing Types
of Jigs and Fixtures Which Aid Precise Alignment.

WHENEVER one part of a mechanical device moves or turns on another part, friction is an incontrovertible result. The friction generated causes loss of energy, in a great measure depending on the materials of which the bearing is composed and the total area of the contacting surfaces.

The elimination of the loss of energy to the lowest

extent possible has been one of the tasks of the modern engineer. The engineers rapid progress in the study of metallurgy and its chemistry, combined with the extensive field for experimenting afforded by the automobile, have placed the roller, the ball and the plain bearing in the exalted position of perfection and distinction they now occupy.

Ball and roller bearings are practically ideal for many locations in the automobile. They are manufactured from a good grade of tool steel, hardened and ground to very accurate dimensions, which allows the renewal of a bearing without ma-

seat should be wiped clean of all dirt and a coating of lubricating oil applied to the outside of the bearing race. The average motorist or mechanic does not realize the damage that can be done by a small chip of metal or dirt, if the bearing is seated

driving in of a bearing with a driving rod smaller in diameter than the outer race of the bearing. In this case the rollers or balls must withstand the impact caused by the blows of the maul in forcing the race into position. There is danger of cracking the balls or race when this method is used, as the bearings are made to a flintlike hardness.

Each type of bearing has points that excel when subjected to different operating conditions. The roller and ball type of bearing is preferred for transmitting the power from the engine to the driving wheels because it consumes very little of the kinetic energy supplied by the engine. The ball type is usually placed where the load is light and uniform. At any point in the transmission system where the load is heavy, and end thrust encountered, the roller type is chosen because of its ability to successfully meet these requirements. The question naturally arises, why isn't the roller and ball type of bearing used in the crank shaft and connecting rod bearings, since it is so nearly ideal?

The reasons prompting the automobile engineers to use the plain bearing in these positions may be directly attributed to the hardness and corresponding brittleness of the roller and ball type, the lack of bearing surface to absorb the shock of the explosion and distribute it to a wide area on the crankshaft, the difficulty to install and disassemble, and the marked probability of extensive damage being done by the breaking of a ball, roller or a race.

The plain bearing is beyond ques-

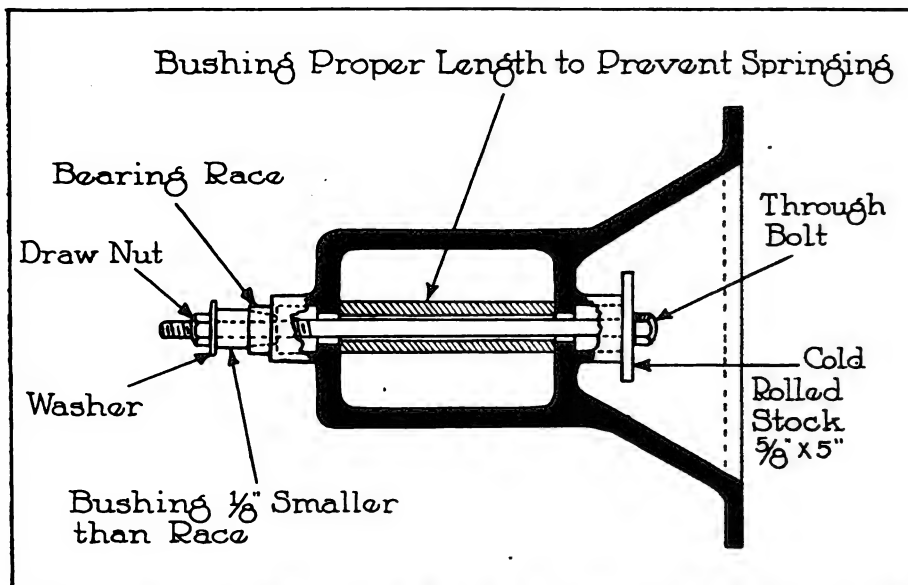


Fig. 1—Light and Fragile Castings Must Be Braced to Prevent Breaking or Springing When Bearing Race Is Being Drawn Properly to Seating Position.

chining any of the parts, the alignments being adequately cared for when the bearing is manufactured.

Precautions are necessary however when installing these bearings as irretrievable damage may be done to the receptive casting by springing or cracking it. Figure (1) illustrates a typical method of drawing home a roller bearing race and also shows how the casting should be braced. Before drawing the replacement bearing home a three cornered scraper should be used to remove all burrs from the edge of the casting hole. The surface of the bearing

upon it. This dirt can throw the entire shaft alignment out, prevent proper seating of the bearing race and make necessary the removal of the bearing.

Sometimes it is necessary to drive the bearings into position by using a hammer or a copper maul, as means are not available to press them in. The person installing the bearing must exercise great care not to allow a canted start (Fig. 2) when driving the bearing into position, as this will cause shearing of the metal which is to retain the bearing race. Another poor practice is the

tion of a doubt the type requiring the most attention as every repair man well knows. The work of adjusting and repairing this type must be done in an intelligent and careful manner. It is not enough to scrape in a bearing nicely. The scraping-in must be done in such a way that all the component parts of the machine will be in the same accord with each other, as when the machine was new.

This condition cannot be achieved if haphazard methods are used when adjusting or aligning a bearing. It is well to bear the fact in mind, that a change of the adjustment of one part of a unit invariably tends to create a different action in another part or parts. For this reason the motorist or the mechanic before making any adjustment should ask himself the question, "What tendency will this adjustment I am about to make have on the preceding operation, or the subsequent operation, of the unit?" In other words, will the adjustment disturb other adjustments so that the unit will not function properly.

Plain Bearing Alloys.

The common type of plain bearing has an alloy shell composed of copper, tin, lead and zinc. Different manufacturers use these metals in various proportions and their product is known by the firm's own trade name. These products are all rightly claimed to be adapted for particular classes of work.

The reason alloys are used as bearings in place of wrought iron, cast iron or steel, is because wear and friction has been found to be more rapid when two metals of the same kind work together. Therefore, it is more desirable to use a soft metal which will take the wear and can be renewed easily, rather than a hard metal which will wear the journal more rapidly. Then, too, the soft metals are more easily worked to the proper shape.

A good bearing composition must have several basic characteristics. It must be strong enough to carry the load without distortion, as the pressure per square inch on the bearings frequently runs into hundreds of pounds. The bearing metal must

not heat readily. This was a serious defect in the old copper-tin bearing which was made of seven parts copper, to one part tin. Though possessing certain good features this metal was found more apt to heat than many other alloys. In general, research seems to show that the harder the bearing metal, the more likely it is to heat. It is also desirable to have the bearing metal work well in the foundry as oxidization while melting causes spongy castings, although in great degree this can be prevented by a liberal use of powdered charcoal during the melting.

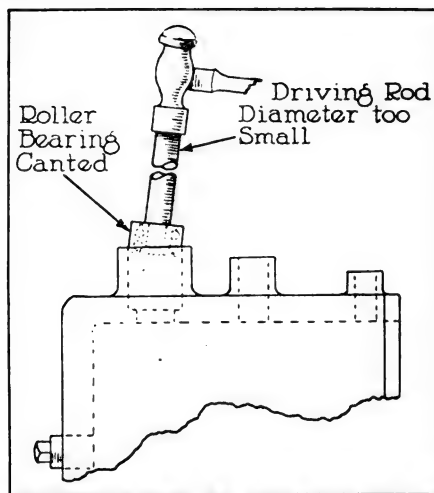


Fig. 2—Bearings Can Be Ruined by the Use of Improper Method of Driving.

The principal element of value in the phosphor-bronze bearing commonly used today, is the addition of one to two per cent. of zinc, or a small amount of phosphorus to a bronze base, the combination making a sound casting as a rule.

One of the leading characteristics that the bearing metal must possess is ability to cause minimum amount of friction. It is true that friction is almost wholly a question of the

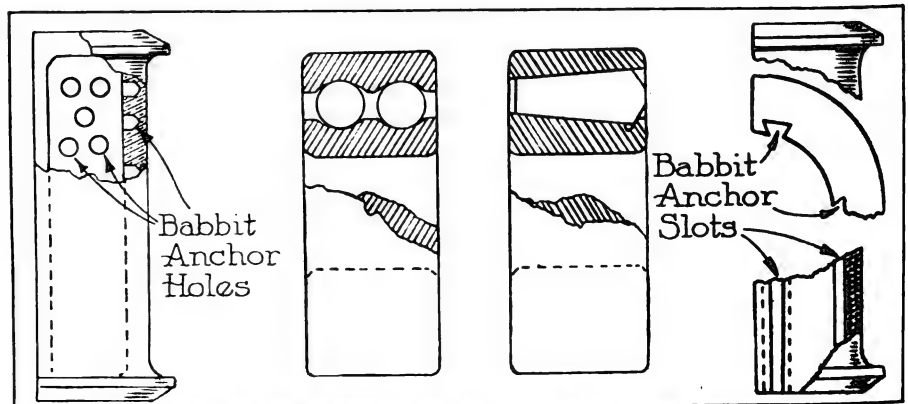
lubricant used; but the metal of the bearing has certainly some influence. All other points being equal, good bearing metal may be chosen for its long wearing quality.

The phosphor-bronze metal has proved its superiority to the old copper-tin alloy of seven to one, in many extensive tests. By experiments it has been found that arsenic may be substituted for the phosphorus in a copper-tin alloy with good results. As the proportion to lead is increased to correspond with the standard, the durability also increases. The influence of lead on this copper-tin alloy seems to be much the same as a still further diminution of tin. However, the tendency of the metal to yield under pressure increases as the amount of tin diminishes, and the amount of lead increased, therefore a limit is set for the use of lead.

Bearing Lining Metal.

The plain bearings of the automobile engine are usually lined with a composition known as babbitt. This is composed of tin, copper, lead and antimony. Among all the soft metals in use there are none that possess greater anti-friction properties than pure lead; but lead alone is impractical, for it is so soft that it cannot be retained in the recesses. But when by any process lead can be sufficiently hardened to be retained in the boxes without materially injuring its anti-friction properties, there is no metal that will wear better in light, fast running journals. Lead is the basis of the majority of the best and most popular anti-friction or babbitt metals.

For wearing properties, where a moderate speed is to be contended



End Views—Bearing Shells Having Holes and Slots to Retain Babbitt in Proper Position. Center—Cross-Sections of Ball and Roller Bearings.

with, there is undoubtedly no metal that is superior to pure zinc. But unless it is combined with some other metal it shrinks so much in cooling that it cannot be retained in the recesses and soon works loose. It also lacks those anti-friction properties which are absolutely necessary for a metal to possess, in order to stand up when subjected to high speed. The addition of tin to the zinc will counteract the shrinking tendency, so that the metal, if not overheated, will firmly adhere to the box until worn out. However this mixture does not possess sufficient anti-friction properties to warrant its use on fast running journals.

Lead and antimony have the property of combining with each other in all proportions without in any way impairing the anti-friction qualities of either. The addition of antimony with lead acts as a hardening agent upon the lead. When these two metals are mixed in the proportion of 80 parts lead (by weight) to 20 parts of antimony, no other known composition possesses greater anti-friction or wearing properties. This combination of metals runs free in its melted state, has practically no shrinkage, will stand a high speed without excessive heat or abrasion and is better adapted to light, high-speed machinery than any other.

Many persons professing to understand rebabbiting and relining of bearings do not give this precaution the strict attention it deserves. If the metal is heated to a cherry red heat and poured into the bearing shell, the outward appearance may not be impaired, but the ability of that bearing to stand up under the work assigned to it is greatly reduced because the composition of the metal has been seriously impaired by the burning it has received. The bearing metal should be heated slowly, and the pouring should be done immediately upon its reaching a temperature sufficiently high to scorch a piece of dry pine wood.

Alignment and Misalignment of Bearings.

The question has often been asked,

"Is it possible to place an old car in as good condition as it was when new?" The writer answers this question emphatically in the affirmative. Overhaul jobs improperly done are

center distance of these holes in the connecting rod so that they are even .032 of an inch closer to one another, the total head clearance will be changed from 4.81 cubic inches to

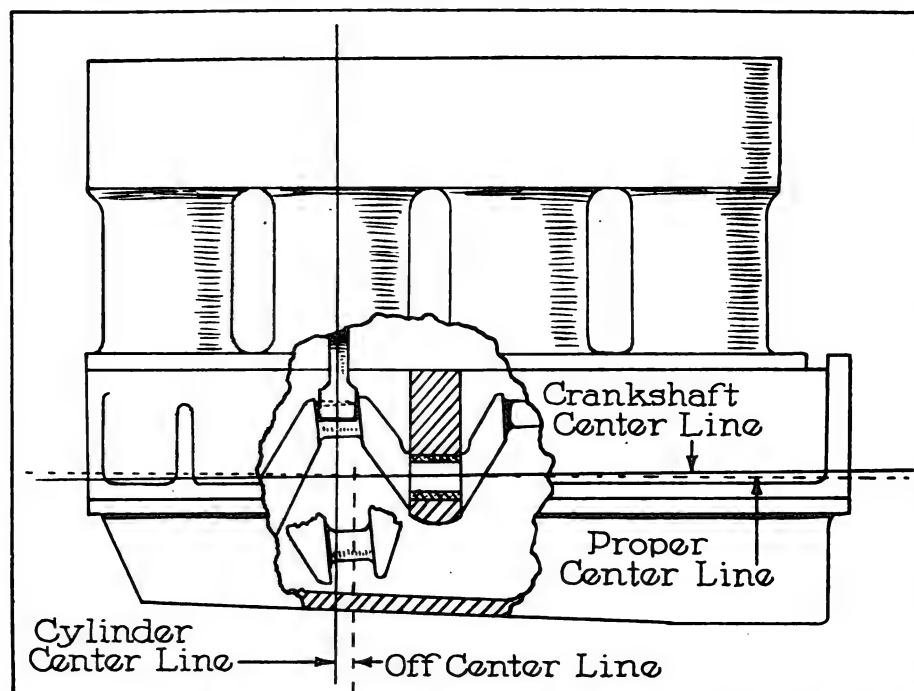


Fig. 3—Resultant Misalignment of the Engine Crankshaft and Connecting Rod After Overhaul in Which Proper Attention Was Not Paid to Vital Details.

responsible for the machine not operating as smoothly and powerfully as it did when new, whereas if this work is carried through in a proper manner the car will give remarkably good service.

We will take as a specific example the renewal of the crank end connecting rod bearings. With most garage men and mechanics it is customary to order replacement bearings from the manufacturer of the car. These bearings are received mechanically perfect in concentricity and dimension. After being received they are placed in the connecting rod ends and scraped to the crankshaft journals. The scraping in many cases is done with an absolute disregard for the correct dimensions which should be maintained between the center of the hole in the wrist-pin end of the rod and the one in which the crankshaft journal revolves. When this method is used, the repair will not be as efficient as the original work done when the machine was being manufactured.

On an engine having a $3\frac{1}{2}$ inch bore and a head clearance of $\frac{1}{2}$ inch, if the repairman or the mechanic, in scraping in the bearings, changes the

5.13 cubic inches. On the other hand if the holes are scraped but .032 of an inch away from one another the head clearance will be decreased to 4.49 cubic inches. It can be readily seen from these figures that the result will be improper and uneven operation of the engine. The scraping-in of the bearings may be done to a nicety, the adjustments may be of mechanical perfection, but all these good points are lost, if the regularly designed dimensions are ruined. The writer will admit the fact, that this attention to detail will increase the time and the cost of the repair work. However the repair is much more satisfactory and the mechanical dimensions of the machine are kept intact, which offsets the increase in time and labor, no matter how great it may be.

As another example of improper alignment, we will sight the usual method of scraping-in or renewing crankshaft bearings. The crankshaft of the automobile engine usually is supported in position by three bearings of the plain type. Two of these bearings control the alignment of the shaft at the engine ends, and one is placed at a central

position on the shaft to help absorb the strain and stress, caused by the engine explosions. Another reason for this center bearing is to prevent the crankshaft of the engine springing out of alignment under the severe torque present in the shaft at all times when the engine is working.

All of the crankshaft bearings must be in perfect alignment with one another, and the work of scraping-in the bearings must be properly done in order that the engine may develop its maximum power, but this is not enough. Usually the engine supplies power from one end of its crankshaft, through a gear, to operate the valve, pump and timer mechanism, while at the other end the flywheel and clutch are located. The power member of any clutch must be in perfect alignment with the driven member in order to insure satisfactory results. The gears also must run at a certain center distance from each other; otherwise the rather common, "whirring-noise," often noticed on an overhauled car is the inevitable result. All these facts make necessary the

crankshaft, liberally covered with prussian blue appear, the chances are greatly in favor of his dropping the timing gear end a few thousandths of an inch and perhaps raising the flywheel end a corresponding amount, or just the opposite result may be obtained. Figure 3 shows an exaggerated result of this kind of a repair.

When a real repair is to be done upon these main bearings, the first thing to ascertain is the amount the bearings are worn from the original dimensions. This may be done by inserting a true test shaft through the bearings and using a surface gauge or a dial indicator to ascertain the amount the shaft has worn from a parallel alignment with the planed surface of the crankcase. An arbor may then be placed in the camshaft bearing and the measurement taken over the outside of the test shaft and the arbor. The true center distance, which should check with the original dimensions of the manufacturer, will be the distance measured, minus the sum of the radius of the test shaft and that of the arbor. When new bearings are being

Renewal of Bearings.

The practise of lining journal boxes with a metal sufficiently fusible to be melted and poured from a common ladle has other advantages besides its anti-friction properties. It also is a cheap and convenient method of forming a perfect bearing in alignment with the shaft, without the necessity of boring it. Boxes that are bored, no matter how accurate, require great care in fitting and attaching them to the frame or other parts of a machine.

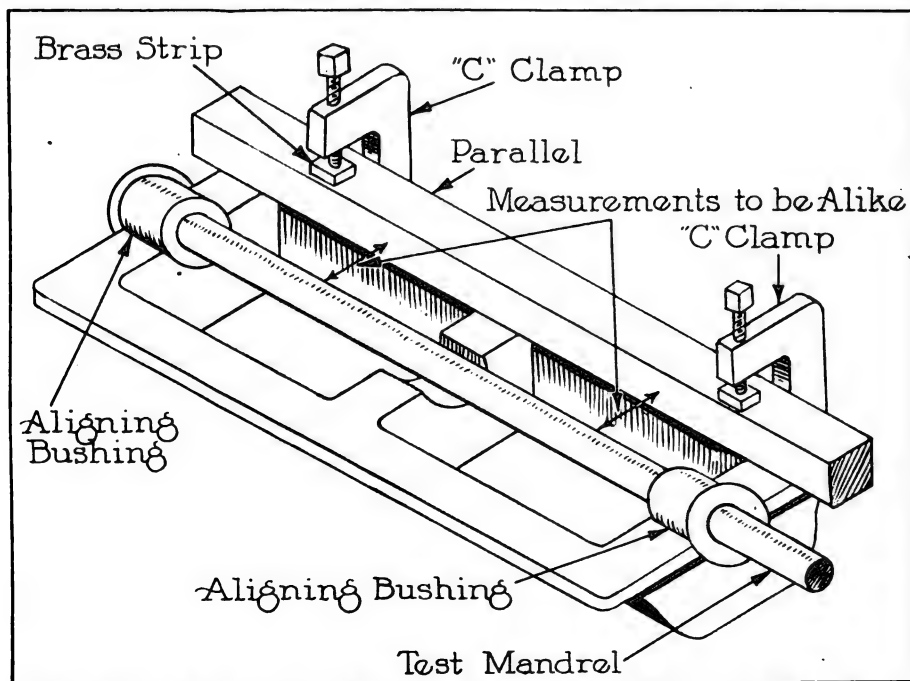
Hot Metal May Spring Shaft.

It is not good practise, however, to use the shaft for the purpose of casting the bearing, for the reason that the hot metal is apt to spring it; the better plan is to use a mandrel of the same size or a trifle smaller for this purpose. In the latter case the mandrel should be about .020 of one inch smaller than the journal, this amount of metal subsequently being removed by a line reamer.

For the purpose of illustrating the care and attention necessary when bearings are being renewed, we will follow the proper procedure in relining the main crankshaft bearings of a modern gasoline engine. It is presumed in this illustration that the mechanic or the autoist has reasons for not wishing to order new bearing brasses, but plans to reclaim the old bearings by relining them with babbitt. The engine has been removed from the car and disassembled. The tools essential in undertaking this repair are: Cast iron parallel, four inches by four inches by three feet long (this parallel must be accurate and perfectly straight); one dial indicator; one surface gauge; one test mandrel of the same size or a few thousandths of an inch less than the diameter of the shaft (this mandrel must also be accurate and perfectly straight); one vernier (preferably of 12-inch length) and an assortment of scrapers.

Melt Out Old Babbitt.

Both the top and bottom halves of the bearings should first be removed from the bearing caps and the main casting; to these bearing halves a blow torch should be ap-



Aligning Bushings Make the Position of Mandrel Certain, Parallel Is Then Exactly Located by an Indicator and Held in This Location by the Clamps.

correct location of the crankshaft when the scraping-in operation is completed.

If a repairman undertakes a repair upon these bearings by scraping wherever the marks made by a

installed or repairs on the old ones being undertaken, all scraping and fitting should be done in a way to bring these measurements to the original ones used on the engine when it was being built.

plied until all the old babbitt metal has been melted out. Extreme care should be taken to have the anchor slots or holes perfectly clear of all old metal, as these dove-tailed slots and holes are depended upon to retain the lining metal in position. Two bushings of the same outside diameter as the bearing holes in the casting and with an inside diameter of a size to fit the test mandrel should then be placed in the holes of the casting which retain the bearings, when the engine is assembled, one bushing being placed in the forward end of the base casting, the other being placed, in a like manner, in the after hole. They are held in this position by clamping them with the bearing cap.

These bushings must now be in the same alignment as the original holes bored in the casting when the engine was manufactured. Therefore, if the test mandrel is inserted in these bushings and supported at each end by them, it also must be in the same alignment as the bushings.

The cast-iron parallel is next placed upon the machined surface of the engine base casting and its position located exactly parallel with the test mandrel by trying each end with the indicator until the pointer registers the same all along the test mandrel from the side of the parallel. The parallel is then clamped in this position by the use of "C" clamps. The work of locating this parallel must be carefully and accurately done, as the parallel affords a ready check at all times on the relining job.

Next the mandrel should be withdrawn from the bushing holes and the lower half of the center bearing shell placed in its proper position. When replacing the mandrel, mount upon it (one on each side of the center bearing), two pieces of $\frac{1}{2}$ -inch pine board, approximately the same outside diameter as the bearing caps and an inside diameter that just fits the mandrel. Place $\frac{1}{16}$ -inch shims between the top and bottom halves of the bearing, in order to allow adjustments to be made at any time. These shims should fit against the test mandrel nicely, in

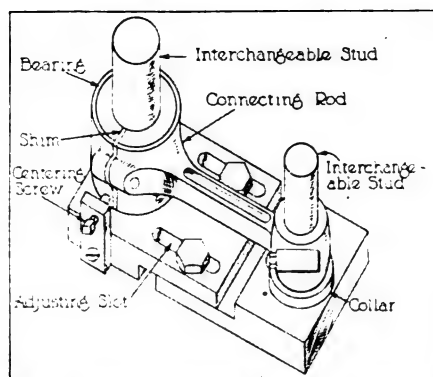


Fig. 4—Fixture Which Aids Materially in Realigning and Rebabbiting Connecting Rod. Note Adjusting Slot.

order to keep the two halves separated when the babbitt is being poured. When cutting the pine boards, a channel-way should be gouged in each. On one of the boards this channel-way serves for the pouring, on the other it affords an escape for the gases. The bearing retainer nuts should be tightened and the pine boards held against the shells by spring clamps. Any crevices should be stopped up with either fire-clay or putty.

Heat Entire Bearing.

While bringing the temperature of the melting babbitt to the proper degree, a blow-torch should be used to heat the entire bearing. This is done to dry the bearing thoroughly and prevent the babbitt cooling too rapidly, in which case the finished job will have a tendency to be pourous. When the babbitt metal becomes hot enough to scorch a dry stick it should be poured immediately into the bearing. In order to obtain a good babbiting repair, a person must not stop pouring until the entire bearing is filled. If the metal is stopped when being poured it will cause a noticeable ridge to appear in the finished job.

When the babbitt solidifies in the center bearing, either of the end bushings may be withdrawn without changing the alignment of the test mandrel, as it will now be supported by one end bearing and the recently poured center bearing. The two boards used to retain the babbitt metal in the center bearing should now be clamped to the end which the workman intends to pour. The process should be the same on this bearing as that performed on the center one.

The completion of the pouring process on one of the end bearings allows the remaining bushing to be withdrawn from the casting, as the test mandrel is now rigidly supported in alignment by the two newly poured bearings. When the last bearings have been poured the bearing halves may be removed, the edges nicely chamfered and all the oil grooves cut, after which they should be scraped to a good fit on the crankshaft journals. While the scraping-in process is being performed the alignment should be kept in perfect concord with that of the parallel, the indicator being used to note any tendency to scrape out of alignment.

Another plain bearing subjected to severe work is the connecting rod crankshaft bearing. In overhauling this bearing usually needs readjustment or renewing. Fig. 4 shows a fixture used by the writer on many occasions, to relign these bearings in preference to installing new ones. The cut is practically self-explanatory, but a few of the advantages of this fixture will be spoken of. By loosening the center cap screws the studs may be adjusted to different center dimensions, thus allowing the rebabbiting of different size connecting rods in the one fixture. A set of studs from $\frac{3}{4}$ to $1\frac{3}{4}$ of one inch make it possible to handle practically any connecting rod relining job with this one fixture. It also makes a splendid testing device for bent or misaligned connecting rods. When this fixture is accurately made it affords a rapid and precise method of reclaiming connecting rod bearings.

If each and every repair on a car is done in a manner corresponding to the ones just outlined, there is absolutely no reason why an overhauled car cannot be made as good as new. New parts and new engines are the result of the factory man's handiwork, but this handiwork can be as skillfully duplicated in a well kept garage as in the manufacturing shop. In the opinion of the writer, what is needed most in our garages is less speed and more accuracy.

RECENT REVISIONS OF CAR PRICES.

| | Old Price | New Price | Decrease or Increase | | Old Price | New Price | Decrease or Increase |
|--------------------------|-----------|-----------|----------------------|----------------------------|-----------|-----------|----------------------|
| American Touring | \$2195 | \$1895 | \$300 | Jordan (Mx) Touring | 2095 | 1795 | 300 |
| American Sedan | | | | Jordan Sedan | 3200 | 2785 | 460 |
| Apperson Touring | 3245 | 2645 | 600 | Kelsey (6) Touring | 1800 | 1525 | 275 |
| Apperson Sedan | 3995 | 3695 | 300 | Kelsey Sedan | 2700 | 2175 | 525 |
| Auburn Touring | 1695 | 1575 | 120 | Kissel Standard Touring | 2475 | 2175 | 300 |
| Auburn Sedan | 2495 | 2395 | 100 | Kissel DeLuxe Touring | 2975 | 2675 | 300 |
| Belle 4-32 Touring | 1495 | 1195 | 300 | Kissel De Luxe Sedan | 3775 | 3475 | 300 |
| Belle 6-50 Touring | 1695 | 1545 | 150 | Kline Kar Touring | 1890 | 1790 | 100 |
| Biddle Touring | 3475 | 2950 | 525 | Kline Kar Sedan | 3090 | 2890 | 200 |
| Biddle Sedan | 4350 | 3950 | 400 | Lafayette Touring | 4850 | 4090 | 760 |
| Brewster Touring | 6000 | 5000 | 1000 | Lafayette Sedan | 6500 | 5175 | 1325 |
| Brewster Sedan | 9000 | 7000 | 2000 | Liberty Touring | 1595 | 1295 | 300 |
| Buick 35 Touring | 975 | 935 | 40 | Liberty Sedan | 2495 | 2245 | 250 |
| Buick 35 Sedan | 1650 | 1395 | 255 | Lincoln Touring | 4300 | 3300 | 1000 |
| Buick 41 Touring | 1525 | 1395 | 130 | Lincoln Sedan | 5400 | 4200 | 1200 |
| Buick 41 Sedan | 2435 | 2165 | 270 | Mailbohm Sedan | 2295 | 2165 | 130 |
| Buick 49 Touring | 1735 | 1585 | 150 | Marmon Touring | 3985 | 3700 | 285 |
| Buick 49 Sedan | 2635 | 2375 | 260 | Marmon Sedan | 5275 | 5150 | 125 |
| Cadillac Touring | 3940 | 3150 | 790 | Merit Touring | 1985 | 1895 | 100 |
| Cadillac Sedan | 4950 | 4100 | 850 | Meteor Touring | 5500 | 5000 | 500 |
| Case Touring | | 1890 | | Mitchell Sedan | 2440 | 2275 | 165 |
| Case Sedan | | 2790 | | Nash (4) Touring | 1045 | 985 | 60 |
| Chalmers Touring | 1295 | 1395 | *100 | Nash Sedan | 1835 | 1645 | 190 |
| Champion Touring | 1195 | 1095 | 100 | Nash (6) Touring | 1545 | 1390 | 155 |
| Chandler Touring | 1785 | 1695 | 90 | Nash Sedan | 2695 | 2390 | 305 |
| Chandler Sedan | 2885 | 2395 | 490 | National Touring | 2990 | 2750 | 240 |
| Cleveland Touring | 1295 | 1195 | 100 | National Sedan | 4240 | 3990 | 250 |
| Cleveland Sedan | 2295 | 1595 | 700 | Noma (3-C) Touring | 2550 | 2100 | 450 |
| Comet Touring | 2350 | 1985 | 365 | Noma Sedan | 3700 | 3200 | 500 |
| Comet Sedan | 3650 | 2985 | 665 | Oakland Touring | 1725 | 1785 | *60 |
| Crow Elkhart (4) Touring | 1295 | 1095 | 200 | Ogren Touring | 4250 | 3750 | 500 |
| Crow Elkhart (6) Touring | 1545 | 1345 | 200 | Ogren Sedan | 5500 | 4800 | 700 |
| Crow Elkhart Sedan | 2395 | 2095 | 300 | Oldsmobile (43-A) Sedan | 1845 | 1795 | 50 |
| Daniels Touring | 5350 | 4350 | 1000 | Oldsmobile (47) Touring | 1625 | 1595 | 30 |
| Daniels Sedan | 6950 | 5950 | 1000 | Oldsmobile Sedan | 2425 | 2295 | 130 |
| Davis Touring | 1795 | 1595 | 200 | Overland Touring | 595 | 550 | 45 |
| Davis Sedan | 2595 | 2195 | 400 | Packard (12) Touring | 4850 | 3850 | 1000 |
| Dixie Flyer Touring | 1195 | 1095 | 100 | Packard (12) Sedan | 6800 | 5400 | 1400 |
| Dixie Flyer Sedan | 1895 | 1595 | 300 | Paige (6-44) Touring | 1635 | 1465 | 170 |
| Dodge Touring | 985 | 880 | 105 | Paige (6-44) Sedan | 2570 | 2245 | 325 |
| Dodge Sedan | 1785 | 1440 | 345 | Paige (6-66) Touring | 2875 | 2195 | 680 |
| Dort Touring | 985 | 865 | 120 | Paige (6-66) Sedan | 3830 | 3155 | 675 |
| Dort Sedan | 1645 | 1445 | 200 | Patterson Touring | 1595 | 1550 | 45 |
| Dort (19T) Sedan | 1195 | 1115 | 80 | Patterson Sedan | 2895 | 2595 | 300 |
| Du-Pont Touring | 3400 | 3200 | 200 | Peerless Touring | 2880 | 2790 | 90 |
| Du-Pont Sedan | 4900 | 4000 | 900 | Pilot (6-45) Touring | 1895 | 1500 | 395 |
| Durant (B22) Touring | new | 1650 | | Pilot (6-50) Touring | 2285 | 2000 | 285 |
| Durant Sedan | new | 2400 | | Pilot (6-50) Sedan | 3400 | 3000 | 400 |
| Earl Touring | 1185 | 995 | 190 | Premier Touring | 3690 | 3100 | 590 |
| Earl Sedan | 1895 | 1695 | 200 | Premier Sedan | 5200 | 5190 | 10 |
| Elcar 4 Touring | 1145 | 1095 | 50 | Premocar Touring | 1295 | 1095 | 200 |
| Elcar 6 Touring | 1590 | 1395 | 200 | Premocar Sedan | 1995 | 1825 | 170 |
| Elcar 6 Sedan | 2495 | 2165 | 330 | R. & V. (4) Touring | 1850 | 1665 | 185 |
| Elgin Touring | 1495 | 1295 | 200 | R. & V. (4) Sedan | 2750 | 2475 | 275 |
| Elgin Sedan | 2395 | 2195 | 200 | R. & V. (6) Touring | 2750 | 2475 | 275 |
| Essex Touring | 1195 | 1095 | 100 | R. & V. (6) Sedan | 3450 | 3105 | 345 |
| Essex Sedan | 1995 | 1895 | 100 | Rickenbacker Touring | new | 1485 | |
| Falcon Touring | new | 3000 | | Roamer (4-75E) Touring | 3650 | 3585 | 65 |
| Falcon Sedan | new | 4000 | | Roamer (4-75E) Sedan | 4750 | 4650 | 100 |
| Ferris 60 Touring | 2695 | 2475 | 220 | Roamer (6-54E) Touring | 2485 | 2585 | *100 |
| Ferris Sedan | 3695 | 3475 | 220 | Roamer (6-54E) Sedan | 3950 | 3850 | 100 |
| Ferris 70 Touring | new | 2795 | | Rolls-Royce Touring | 11,750 | 10,900 | 850 |
| Ferris 70 Sedan | new | 3795 | | Saxon Touring | 1295 | 1195 | 100 |
| Ford Touring | 355 | 348 | 7 | Saxon Sedan | 1995 | 1795 | 200 |
| Ford Sedan | 660 | 645 | 15 | Sayers Touring | 1795 | 1695 | 50 |
| Franklin Touring | 2350 | 2450 | *100 | Sayers Sedan | 2995 | 2795 | 200 |
| Franklin Sedan | 3350 | 3450 | *100 | Seneca L. & C. Touring | 1045 | 945 | 100 |
| Gardner Touring | 1095 | 895 | 200 | Standard Touring | 3400 | 2500 | 900 |
| Gardner Sedan | 1695 | 1595 | 100 | Standard Sedan | 4800 | 3600 | 1200 |
| Grant Touring | 1285 | 1385 | *100 | Standard Sedan | 3600 | 3200 | 400 |
| Grant Sedan | 1950 | 1945 | 5 | Stearns Touring | 2450 | 2250 | 200 |
| Gray Touring | new | 490 | | Stearns Sedan | 3700 | 3450 | 250 |
| Gray Sedan | new | 760 | | Stephens Touring | 1850 | 1745 | 105 |
| H. C. S. Touring | 2775 | 2400 | 375 | Stephens Sedan | 2850 | 2650 | 200 |
| H. C. S. Sedan | 3650 | 3150 | 500 | Studebaker (EJ-40) Touring | 1150 | 1045 | 105 |
| Handley-Knight Touring | 2850 | 2650 | 200 | Studebaker (EJ-40) Sedan | 1850 | 1750 | 100 |
| Handley-Knight Sedan | 3750 | 3450 | 300 | Studebaker (EH-50) Touring | 1635 | 1475 | 160 |
| Hanson 60 Touring | 1795 | 1595 | 200 | Studebaker (EH-50) Sedan | 2550 | 2350 | 200 |
| Hanson Sedan | 2885 | 2585 | 300 | Studebaker (EG-60) Touring | 1985 | 1755 | 230 |
| Hatfield Touring | 1495 | 1395 | 100 | Studebaker (EG-60) Sedan | 2950 | 2700 | 250 |
| Hatfield Sedan | 2395 | 1950 | 445 | Stutz Touring | 3350 | 2990 | 360 |
| Haynes 55 Touring | 1785 | 1595 | 190 | Templar Touring | 1985 | 2125 | *140 |
| Haynes Sedan | 2835 | 2595 | 240 | Vellie (48) Touring | 1585 | 1395 | 190 |
| Haynes 75 Touring | 2485 | 2395 | 90 | Vellie (48) Sedan | 2485 | 2085 | 400 |
| Haynes Sedan | 3485 | 3395 | 90 | Westcott (C-48) Sedan | 3490 | 3290 | 200 |
| Hudson Touring | 1895 | 1745 | 150 | Wills St. Claire Touring | 2875 | 2475 | 400 |
| Hudson Sedan | 2895 | 2650 | 245 | Wills St. Claire Sedan | 4100 | 3475 | 625 |
| Hupmobile Touring | 1485 | 1250 | 235 | Willys-Knight Touring | 1525 | 1375 | 150 |
| Hupmobile Sedan | 2150 | 1935 | 215 | Willys-Knight Sedan | 2395 | 2095 | 300 |
| Jackson Touring | 1635 | 1485 | 150 | Winther Touring | 2750 | 2250 | 500 |
| Jackson Sedan | 2985 | | | Winton Touring | 4600 | 3400 | 1200 |
| Jewett Touring | new | 1065 | | Winton Sedan | 6200 | 4550 | 1650 |
| Jewett Sedan | new | 1395 | | Yellow Cab Touring | 2800 | 2340 | 460 |

The Victor Pagé Aero-Type Four

(By S. G. SWIFT.)

BACK in 1904, or thereabouts, the automobile was as much a mystery as a luxury and doubtless fully merited the somewhat contemptuous appellation of, "a rich man's plaything." The average person thought of it as a passing fad, a mere mechanical toy that frightened horses and polluted the air with the odor of noxious gasses, and the possibility that the machine might some day be practical, had lit-

tle credence in the mind of the layman. But a certain group of far-sighted men had faith in the ultimate development of the crude, gas propelled vehicle, to a place where it eventually would take premier rank as the most economical and efficient form of passenger transportation that the world had ever known—a faith that has been justified in striking manner.



Beautiful Body Design is a Feature of the Victor Pagé Aero-Type Four Sedan.

AMONG the group of early enthusiasts in whom the advent of the motor car instilled a firm belief as to its ultimate evolution was a young man whose home was in Providence, R. I., a mere boy in truth—who had a decided burden on his shoulders, as he was the sole support of a mother and several younger brothers and sisters. He had been forced by circumstances to leave school and go to work at a very early age, assuming his responsibilities at a time when the average youth is contemplating nothing more serious than the casual pursuit of boyish interests.

Always of a studious nature, he had early determined to secure an education in some manner or other, and felt keenly the situation that had deprived him of continuing at school. But, like many another who has seemed to grow the stronger through adversity, he determined to continue with his studies, and to this end entered night school, which he attended faithfully for several years. Every moment during the day, when his work permitted, he was at his books and it quite naturally happened that he was graduated from his classes with honors at practically the same age at which he would have finished the same grades in day school.

So much for the determination that has ever been the outstanding characteristic of this man—a determination that has ever seemingly resulted in the ultimate achievement of any project which he has started.

It was but a matter of course that his

success with his studies had also been reflected in his daily work, and, youth though he was, he now held a position of responsibility within the organization with which he had allied himself. But his belief in the future of the automobile,

which never wavered, had now reached a point where he felt that he must become identified with the industry even though in a small way, and we next hear of him leaving the good position which had meant so much to him and going to work in one of the pioneer automobile agencies of his native city.

It was no great position that he held at the beginning of this work—just a helper around the garage, oiling the cars, blowing up the tires and filling the gasoline tanks of the machines with the old five-gallon oil can and the tin funnel of that day. In a few months, however, things happened. His uncanny ability to locate and remedy motor troubles had caused him to become known as the best repairman in the state—a doctor of automobiles, if you please, and one whose diagnosis was mostly correct.

So pronounced was his success with those automobiles of early vintage that he was soon called to another organization where he was made head of the repair shop and service station, his whole time and effort being given over to the handling of machines whose idiosyncrasies were beyond analysis by the

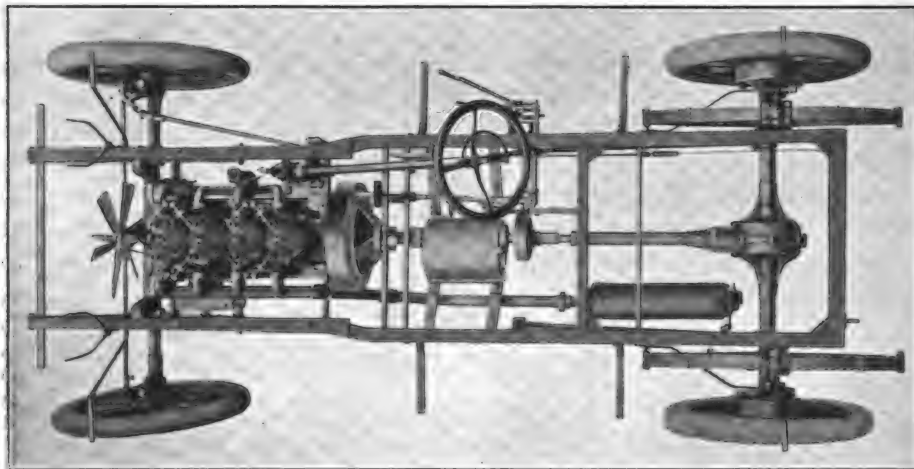


The Sumptuous, Well-Appointed, Convertible Sport Model—a Victor Pagé Product.

average repairman—and oftentimes the factory expert as well.

The early types of automobiles were intricate and puzzling in the extreme,

and found it impossible to continue to build the machines at a profit, due chiefly to the high overhead consequent on the inferior shop equipment of that day.



Chassis of Car Built in 1906 by the Victor Pagé Motor Vehicle Company.

and as many an old car owner can testify, there were times when they seemed, without cause, to take on added eccentricities which baffled even those men who had designed and built them. It quite naturally follows then, that the services of the man who could fathom their mysteries to the extent of coaxing them to function properly were in great demand and the fact that this young man, though still in his 'teens, was frequently called on to go to cities hundreds of miles from his home to reason with some refractory automobile that had consistently refused duty, was proof of his almost uncanny ability.

It is entirely in accordance with the general scheme of progress that we next hear of this young man as the designer of an air-cooled car which was built in Providence, R. I. This car, far in advance of its time, was called wholly practical by experts of that early day—of good design and mechanically right, and many of the factory's products were successfully operated for years by the purchasers.

The promoters of this car, entirely as enthusiastic and trustworthy as the designer, were unused to financing any large product such as the one in hand.

Finally the company, though firmly convinced of the utility of its product, decided to discontinue operations rather than in any way cheapen the cars, until such time as labor-saving machinery would be developed to the point that the automobiles could be economically built to the high standard demanded by the designer.

The young man was in no way discouraged. He had seen that his ideas were fully as practical as he had expected them to be, and the failure of the organization to function properly merely strengthened him in his determination to build a car at some future time, and to obtain the executive and business experience he lacked at that time so he could successfully head an organization of his own.

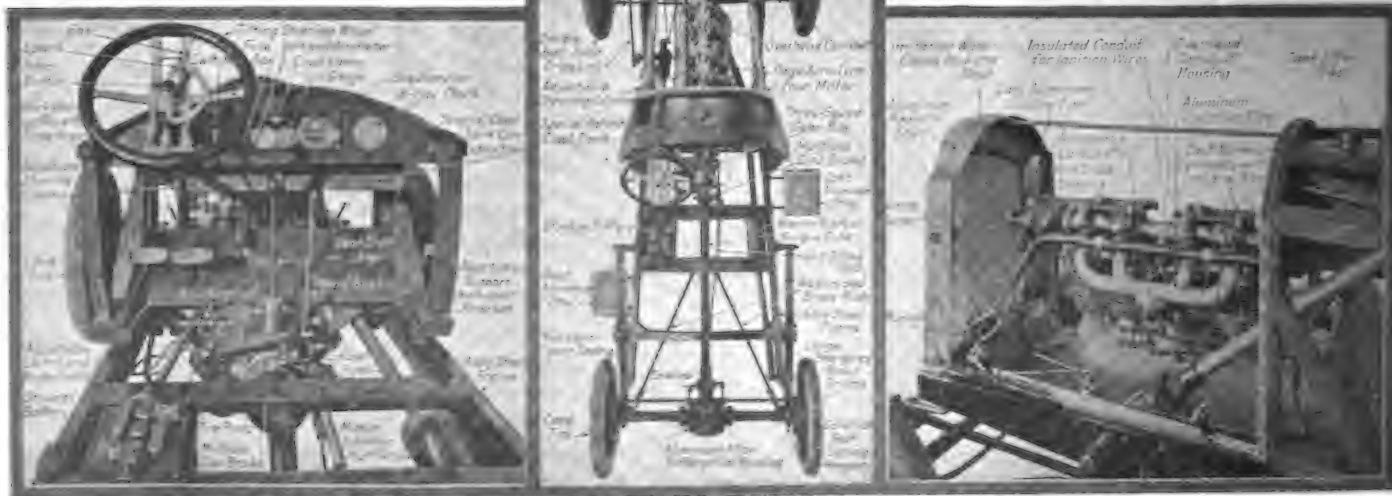
That his ability was recognized by others than those directly connected with the automobile business, and that this ability was not confined wholly to the shop practise of mechanics, is shown by the fact that he became associated

at this juncture with the Automobile Journal Publishing Company, one of the oldest publishers of automotive journals covering the various phases of the industry. Always facile at expressing himself, his articles soon attracted attention and in a short time he was recognized by national interests as one of the best practical authorities on motor car construction and operation of the times. Intensely interested in his new work, he applied his knowledge to good advantage, and two years after entering the journalistic field was made managing editor of the several monthly and yearly business and technical magazines published by the company, having also to his credit along this line the authorship of several volumes on automotive practise which today are recognized as being standard in the industry.

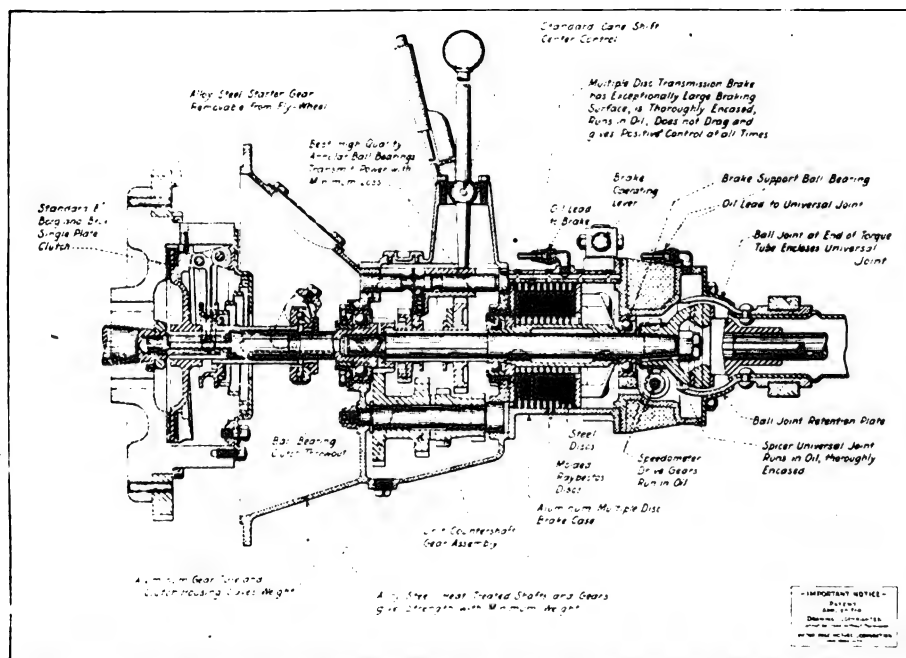
During this period of his career he frequently came into intimate contact with representative car builders, and became well known to the engineering fraternity throughout which his acquaintance is large and far reaching. It is no exaggeration of the actual facts to state that his advice and council were frequently sought by men who rank today as leaders of the industry. His knowledge was broad, and his experience, up to that time all that could be gained by the average man.

As a material evidence that his worth was such as to entitle him to the consideration extended by those in authority, it may be stated that he frequently refused positions offered by some of the most reputable car manufacturing organizations in America. Finally an offer was extended that he could not consistently refuse, however, and he became associated with one of the largest manufacturers of ball bearings in the United States as a product developer and business builder. Here again, true to the line of his former achievements, he made good, and was said to have added materially during his six years connection in expanding the firm's business, which at that time ran well into the millions for yearly sales.

At this juncture the world war came along, and this young man, though holding a position of great trust and one in which the remuneration was commensurate



Detail View Showing Chassis and Engine Design and Construction. Note Clean Lines and Well-Balanced Appearance.



Clutch, Change Speed Gearing, Multiple Disc and Transmission Brake Assembly.

rated at 30 horsepower at 2800 revolutions per minute. The cylinders are of silico-aluminum alloy, and the heads are air-cooled. Cylinders are cast integral with the top half of the crank case, liberally flanged for cooling, and, to resist piston wear, are provided with steel liners which are accurately ground after insertion, thus insuring a perfect and smooth bore.

Cooling System Another Patented Feature.

The cooling system, because of the design, is one of the most important factors and one which, in great measure, accounts for the practicability and utility of the power plant.

Several features have been patented by Major Pagé, chief of which is the geared fan drive. This drive has a cast aluminum, four blade, true pitch, propeller type fan with an automatic releasing clutch, which in conjunction with the well ribbed aluminum cylinders should give freedom from overheating.

The cylinders and heads, being aluminum, have greater conductivity than cast iron. There are no pipes or connections to break or leak on the Victor Pagé Aero-Type Four motor, neither are there pumps or radiators to clog or become loose. The cooling system of the Victor Pagé car is very simple and positive.

New Type Pistons.

The pistons are of a new type, made of constant clearance aluminum alloy, with a split skirt to insure a correct fit. They are carefully sized to prevent piston slap, and are inspected and weighed to insure even balance. They have a flat top which is highly polished, thus minimizing carbon deposits which are so apt to occur where the top is left unfinished. The connecting rods, light and strong, are made of alloy steel, drop forged and carefully machined and balanced.

Counterweighted Crankshaft.

The camshaft is vanadium alloy steel and is driven by spiral bevel gears. The balanced type crankshaft with coun-

terweights forged integrally, is made of specially selected nickel steel. It has large annular bearings at the ends, with a plain bearing in the center, which makes for stiffness and strength.

The valves, of large size, are seated in detachable cylinder heads of aluminum silicon alloy, and have air cooled

flange stem guides. The exhaust valves are cobalt-chrome steel, the intake valves being tungsten chrome steel.

The crankcase is cast aluminum alloy with an aluminum oil pan. It is barrel shaped and liberally ribbed for stiffness. The flywheel housing is cast integrally.

Lubrication Simple and Effective.

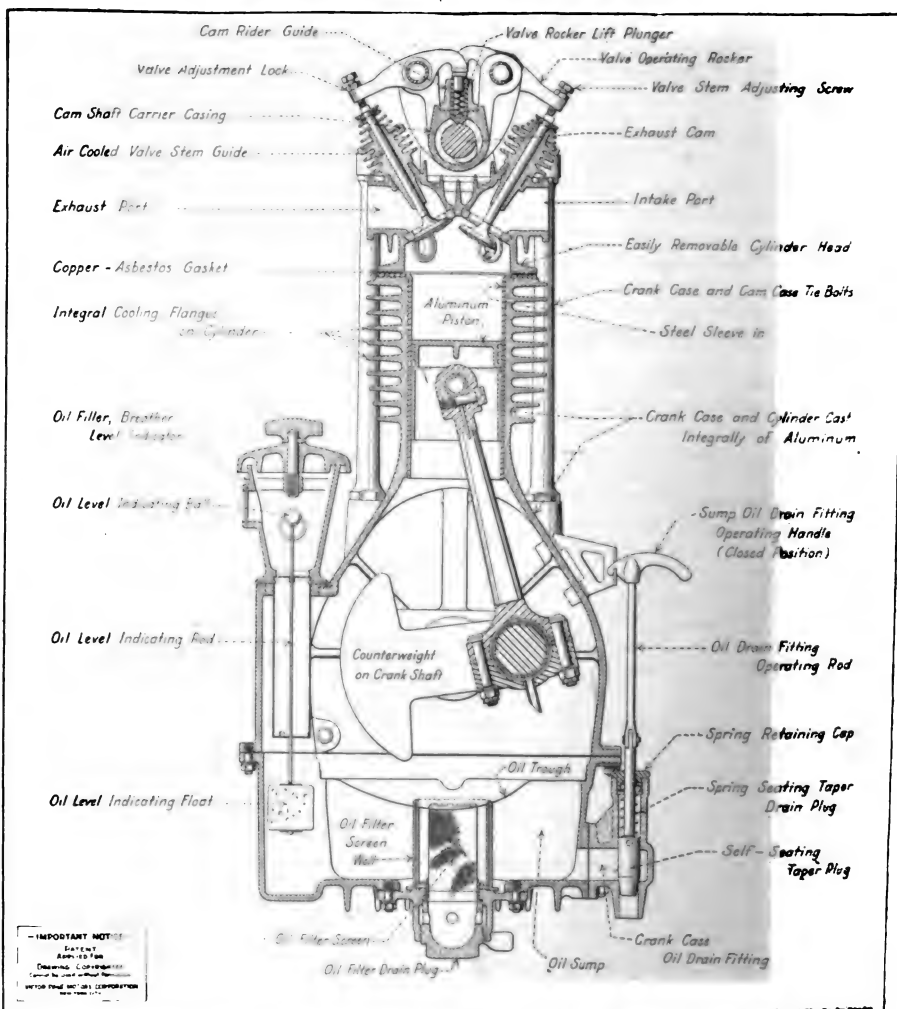
Lubrication of the Victor Pagé Aero-Type Four is simple and effective. It is of the force feed type, the proper amount of pressure being supplied by a powerful pump invented by Major Pagé. The pressure regulating device is incorporated with the oil distributing manifold in conjunction with a patented breather, oil filler, and level indicator fitting. The drainage way, or sump, is air cooled and of large capacity.

Borg and Beck single plate clutch of a standard design is used. The transmission has a special Victor Pagé multiple disc brake incorporated, and is of three speed, selective type. All gears and shafts are of alloy steel with New Departure annular bearings.

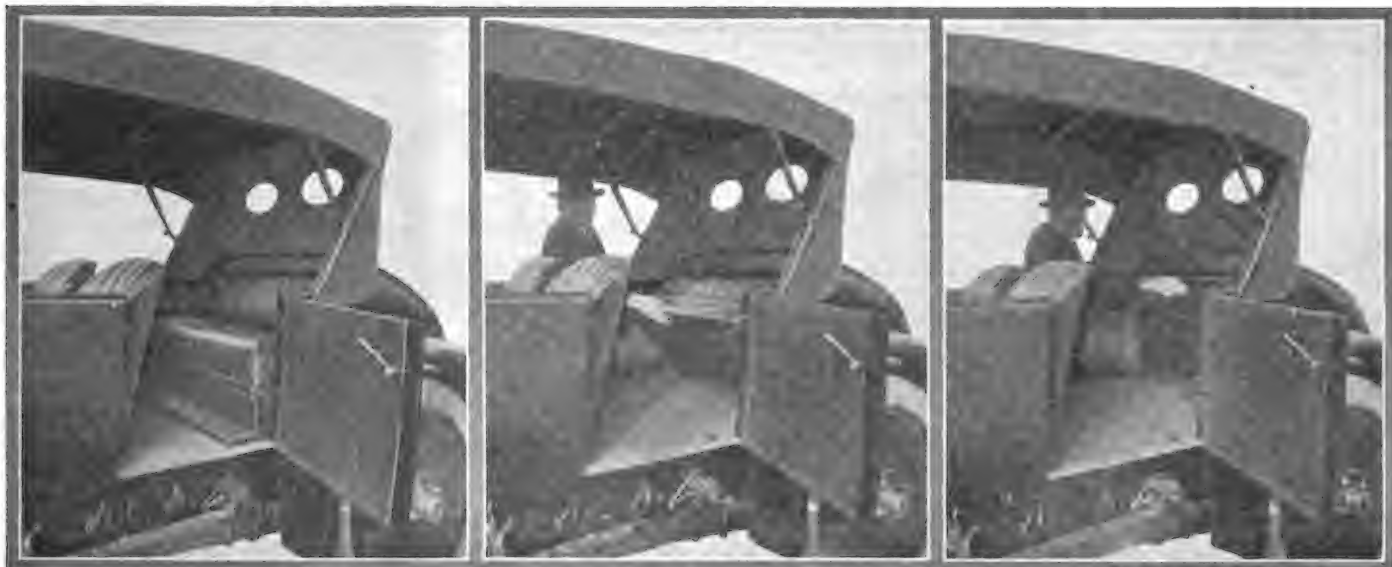
Concealed Tank of Large Capacity.

The fuel system is gravity feed from a patented cowl tank in the open cars, and vacuum feed in the enclosed drive models. The tank, skillfully concealed, is of a capacity that will enable the motorist to drive more than 200 miles on a single filling.

Compensating nozzle, automatic type carburetors are the choice of the design-



Section View of Number Two Cylinder of Victor Pagé Aero-Type Four Engine.



Views Showing Patented Disappearing Seat of Victor Pagé Aero-Type Four Convertible Sport Model.

er for the Aero-Type Four, and these are furnished with a choke valve for easy starting in cold weather, the manifold being of aluminum.

Starting and lighting are accomplished by the use of a six volt storage battery. The generator and starting motor are placed in accessible locations. A high tension magneto ignition system is used.

Drum type headlights of the single bulb type afford a powerful light, operated in connection with a switch for dimming. Parking lights are standard equipment.

The frame is of alloy steel to which all fittings, cross members, and gusset plates are hot riveted. The wheelbase is 119 inches and the tread is 56.

Unusual Spring Suspension.

The springs embody patented features, one of which is the Victor Pagé combined coil and leaf spring for the front suspension, and full canti-lever rear springs. Both front and rear springs are made of specially selected alloy steel leaves of which are carefully graded before assembling.

The steering system of the Victor Pagé car is of the worm and nut type, irreversible, adjustable, and easily operated.

The 17 inch wheel is tilting, and is constructed of black walnut and aluminum.

Perhaps no other car of the price and



Major Victor W. Pagé.

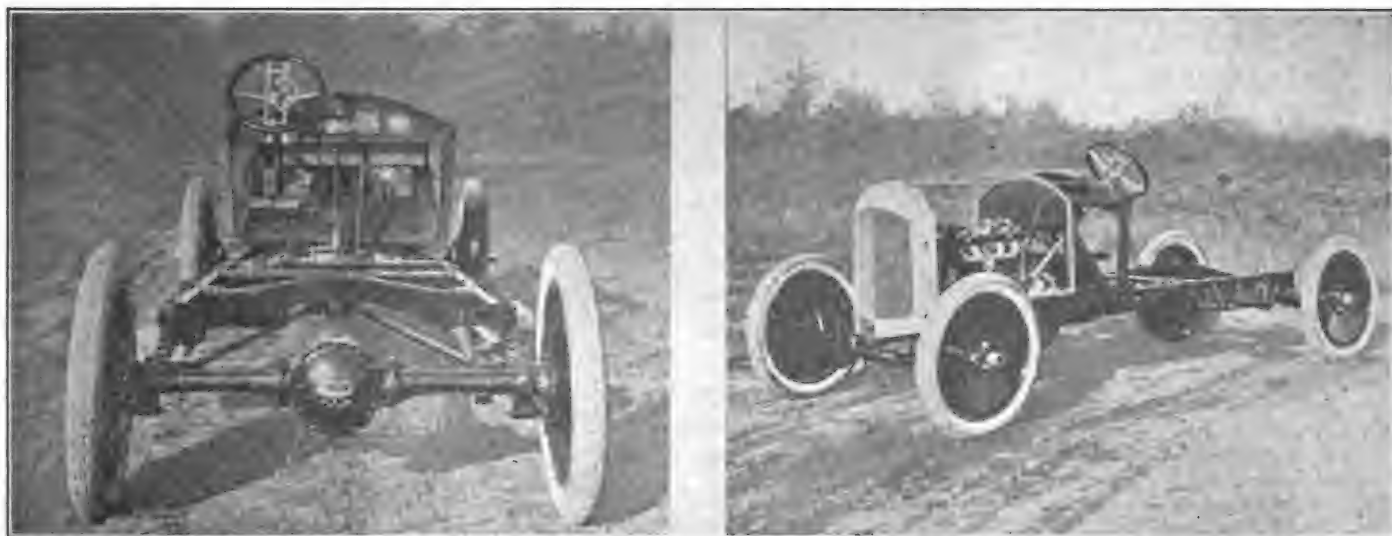
size of the Victor Pagé Aero-Type Four has such a commodious luggage compartment. From the casual glance, an ob-

server would fail to locate this storage space, which is at the rear of the body. The back seat seems to be of the conventional type—yet the entire space of the rear compartment is quickly available by merely tilting the seat backward. This is patented and is known as the Victor Pagé Patent Combination Type Convertible Rear Compartment. The Victor Pagé Aero-Type Four is delivered completely equipped to the purchaser.

While there are many new features, it would seem that none are radical in design. Special care has been taken in designing to consider the factors making for comfortable seating of passengers and accessibility of all mechanism. It is said to be the first air-cooled car to follow standard lines to be sold at a moderate price.

Major Pagé has built up an organization including experienced men to manufacture and distribute the Victor Pagé Aero-Type Four that well lines up with the standards incorporated in his car. The officers of the corporation are:

Victor W. Pagé, president and chief engineer; Frank R. Mead, vice president and treasurer; John P. Knox, secretary and general counsel; Percy Denton, as-



Two Views of Chassis of Victor Pagé Aero-Type Four, Showing Various Units and General Design of Car.

assistant treasurer; Nicholas Pullman, sales manager; Rudy Sanders, assistant chief engineer; Joseph Kubacha, chief body engineer; E. F. McCarthy, superintendent of plants; Maurice Marony, superintendent of construction; Harold Revara, manager Lafayette Street Shop, and Arthur A. Michaud, special New England representative.

The directors are: Victor W. Pagé, New York City; Frank R. Mead, Stamford, Conn.; John P. Knox, New York City; Harold Revara, New York City; Ethel R. Pagé, New York City; Pierre Dandurand, New Bedford, Mass., and Arthur A. Michaud, Providence, R. I.

Plant Nears Completion.

The first unit of the Stamford, Conn., factory is nearly ready for occupancy.

Work has been started on the second unit of the plant, and it is planned that midsummer will see the cars being produced in quantities.

For the time being, production will center on the Aero-Type Four, in an open

produced, and it is probable that certain other designs may be manufactured at a later date.

The market for the Victor Pagé Corporation's product would seem to be assured. Dealers have shown decided interest in the car; territory should be easily allotted and all things considered, from the present outlook it appears that Major Pagé and his associates have chosen a psychological time in which to introduce to the market a car patterned after his own ideas—an automobile that will gain and fully merit the favor of the motorist who is looking for a substantial, well-constructed vehicle that will give maximum of service with minimum of expense, that will exemplify the best traditions of the industry.



Car and Engine Built by Victor Pagé in 1906.

and closed model, and the "Utility" Four. A "Utility" truck also will be pro-

Adapts Radio Set to Car.

THE CHEVROLET Motor Company has proved that radio equipment operates satisfactorily in an automobile without the use of a "ground."

The possibilities that this portable radio receiving station offers include an almost limitless field of use and, with such tremendous strides as these made

in its development, it is bound to become one of the indispensable utilities of modern civilization.

With a car equipped in this fashion it is possible for a family to drive anywhere within 100 miles or so of a broadcasting station and picnic while the radio in their car amuses or instructs them with music, sermons, or wireless telegraphy. Education and entertainment can be transported to wherever people congregate. With a few cars equipped as this one is, a minister could talk to a dozen congregations at once. If the United States Department of Agriculture had a similar radio equipment in the hands of its county agents, department experts could talk to thousands of farmers at once and thus bring the tremendous added benefits to our agriculture that would be made possible through a greater broadcasting of its work.



Sedan Equipped with Radio Receiving Set by Chevrolet Motor Company.

DECREASED TRADE IN THE NETHERLANDS.

American motor vehicles, although just as popular as ever, are being undersold by European makes; and only a reduction in price in the United States, as well as an improvement in its rate of exchange with the Netherlands, would increase the prospect for sale of American cars.

While the importation of passenger cars from all countries decreased greatly in 1921, the falling off in importation of cars from the United States was exceptionally great, and toward the latter part of the year represented almost a collapse in the trade in American machines. The chief reasons for this decrease were the high rate of exchange between the Dutch guilder and the American dollar (thus increasing the guilder price of American

machines) and an oversupply of our cars at the beginning of the year.

USERS.

REGISTRATION lists give a quick picture of the many uses of the motor car. A sample 100 names of the Massachusetts list include: 1 visiting nurse association, 2 grocery companies, 1 ice company, 1 bricklayers union, 2 banks, 1 candy factory, 1 tabulating machine company, 1 spark plug dealer, and 1 packing company.

AMERICAN CARS PREDOMINATE IN SHANGHAI.

American automotive interests should put forth every effort to help the good roads movement which has started in China in the hands of prominent men. The Shanghai motor census illustrates that such endeavors would, doubtless, show results.

While Shanghai is but 8 miles in length and there are no motor roads leading out of the city, it had on January 1, 1922, a motor population of 3242 passenger cars (of which 30 were electric) and 536 motor trucks. The total 3,778 constitutes an increase of approximately 30 per cent over the number in use on January 1, 1921. It has been calculated that approximately 87 per cent of these cars are American, of which 10 well-known American makes predominate.

ACCESSORIES DEPARTMENT

D-REX-U Signal is a safety signal that is attached to the top of the left rear fender and is visible, through lenses, to all pedestrians, motorists and traffic patrolmen within vision, from both the front and rear. This feature alone is an invaluable asset to the motorist.

It is stated with the D-REX-U one does not show any confusing signals, as it is operated by a three-button push switch located on the left hand side of the steering wheel and hand is not taken off the wheel.

The D-REX-U Signal is simple in construction and operation and it is said that any motorist can keep it in repair at all times without the assistance of an electrician. If a bulb burns out the driver

instrument will locate any electrical trouble, telling one at a glance where the trouble is and what it is. A practical and rugged, though inexpensive electrical measuring device, which is not only one of six different instruments, but is all six combined in one, and is claimed to make all tests accurately, positively and by the most approved method.

The generator output, rate of battery discharge, single lamp current consumption, entire lamp load, voltage of storage battery, voltage of single cells, current required for starting motor, are accurately determined by this instrument. It also will detect leaks, grounds, short or open circuit in armatures, fields or commutators of motors and generators. It is a small, neat and compact instrument and can be carried in the pocket.

Sold by **Burton-Rogers Company, 755 Boylston Street, Boston, Mass.**

Onkes Spare Steel Wheel Lock, a distinctive and effective device, designed to give the thousands of motorists now carrying spare steel disc or wire wheels more adequate protection against spare wheel thieves, has been recently placed on the market by a company well known in automotive circles as a large manufacturer

rier, and keeps the wheel secure from theft until the owner's key is used to remove the lock. To install the lock, its makers claim, takes but a few minutes and can be done easily with the aid of ordinary tools.

After the primary installation the device can be unlocked and the wheel demounted or vice versa, in a very short time, when the correct key is used.

To make this lock a thing of beauty as well as safety, the lock-housing, wing arms and lock face are highly polished. The lock proper is a type approved by the Underwriters' Laboratories and has almost unlimited key changes. It revolves in the housing and hence is very difficult for a thief to force.

Manufactured by the **Oakes Co., Indianapolis, Ind. Price, \$7.50.**

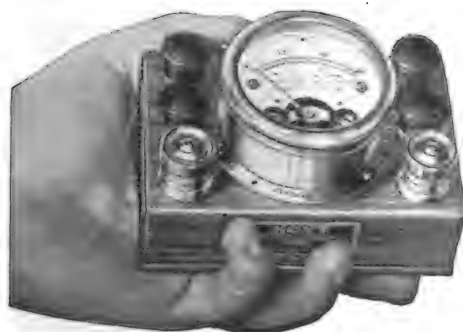
Spad Timer for Fords recently put on the market is built on somewhat different principles to many others, as it is similar in construction to a magneto distribu-



Immediately knows it, as he can always see the D-REX-U Signal by a glance over his left shoulder or into the back mirror, and its simplicity of construction makes the replacing of the bulb an easy task. The D-REX-U is built of steel and finished in baked enamel. Price, \$12.50.

Manufactured by the **Comstock-Bolton Company, 1925 East 15th Street, Kansas City, Mo.**

Hoyt Multiple Tester, a combination of six electrical testing instruments in one recently put on the market is said to be a great help to the electrician and meeting with a wide range of approval. The



of radiator fans, tire carriers, tire locks and other metal parts for motor vehicles.

The new wheel lock is similar in principle to the tire lock perfected by this company several months ago. It consists of three simple parts, a barrel-shaped lock housing, with two wing arms, which is an aluminum alloy casting reinforced with a hardened steel insert, a combination locking nut and washer and a removable, non-pickable, dust-proof lock which fits into the outer end of the lock housing. The lock itself is held in place by means of two movable lugs, which engage a flange inside the slot.

The device is installed on the stud which projects through the hub of the spare wheel when mounted on the car-



tor. Both units of this timer are claimed to be made of high grade insulating material, which makes short circuits impossible. The shell, which is the most expensive part, is practically indestructible.

The average life of the brushes and rotor is more than one year it is claimed, and they are easily replaced. It is stated that the contact made between the phosphor bronze segment in rotor and copper carbon brushes in shell is nearly ideal and is kept in this state by a phosphor bronze spring attached to the brushes. On an old motor it is not effected by a wobbly cam shaft it is stated, as the rotor is a flat disc, having no moving parts such as the customary brush and roller. This timer is said to be giving unusual satisfaction.

Manufactured by the **Spad Manufacturing Company, Incorporated, 42-A West 38th Street, New York City, N. Y.**

(When Writing to Advertisers, Please Mention the Automobile Journal.)

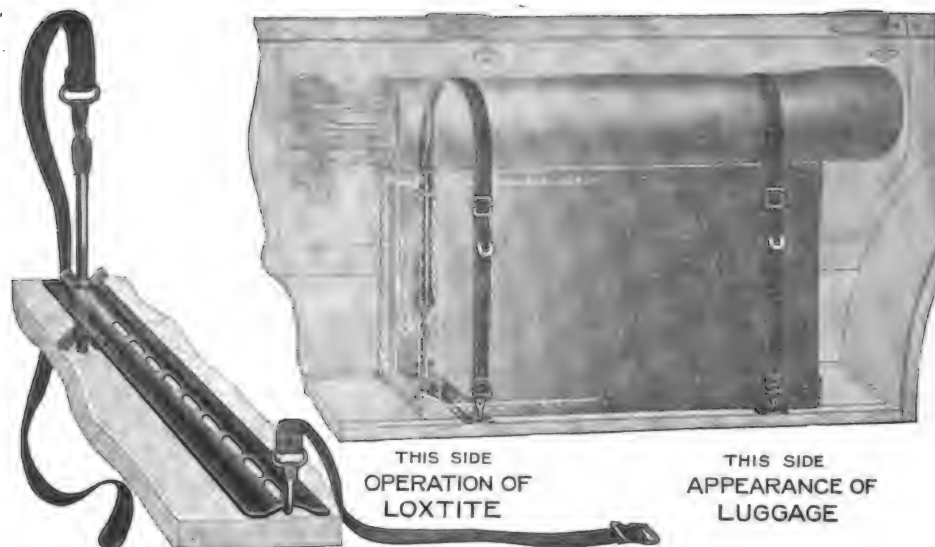
Loxtime Luggage Carrier is said to be the smallest and most compact carrier manufactured. It is easily slipped into the door pocket of the average automobile. It can be attached or detached with ease, or it can be left on the car ready for instant use without appearing unsightly on the running board or hindering

tites will carry six suit cases and tents.

The convenience with which the luggage may be removed is really remarkable. It is only necessary to unsnap the straps and the running board is free and unobstructed.

This carrier may be used on all cars, even the closed models, as it can be placed

It is said that the combination tool can be used as a drill for drilling holes in metal or wood and when used with the grinding attachment will cover the average requirements for grinding. The complete weight of this tool is but 18 pounds, yet the motor develops one-half horsepower under load. In addition this tool is fitted with an automatic stop type of switch, which insures the absolute control



ENLARGED VIEW

the opening of the car doors. It also prevents the luggage from scratching and marring either the car or itself, as it holds it tightly in the proper position. The carrying capacity is limited only by the size and strength of the running board, as the Loxtime will carry luggage of any shape or description which can be placed on the running board. Two sets of Lox-

in any position along the running board.

The manufacturer states that the Loxtime will not rattle, when properly installed, and that the standard weight of the two models is one and 1½ pounds respectively.

Manufactured by the Loxtime Carrier Company, Incorporated, Niagara Falls, N. Y.

of the tool by the operator at all times. All aluminum castings are used in the construction of this machine. The tool is simple in construction yet so rugged it will withstand the hard service to which a tool of this type is frequently subjected. The motor is of the universal type, consequently it can be operated on either the direct or alternating current of the same voltage.

The entire tool is built at the Wodack factory and in addition to the regular guarantee of one year against electrical or mechanical defects, the maker also agrees to rewind the motor once free of charge, during the same period, should it be burned out from any cause.

Manufactured by the Wodack Electric Tool Corporation, No. 23 South Jefferson Street, Chicago, Ill.

Marquette Quick Action Tire Tool is claimed to grip a tire without tearing it—coax it from the rim in an instant; and as quickly and as easily put it back on again. Getting a tire off and on is the hardest, dirtiest, most exasperating work about a car and this tire tool was designed for the one purpose of handling the job.

To take the tire off place jaws over tire, grip the tire as close to the rim as possible, squeeze handles tight without pulling either direction, move handles toward outside of wheel so as to loosen inner bead of tire from rim; then move handles of tool in toward car; this will loosen outer bead of tire, at the same time place shoe under the two beads and rest on edge of rim, then proceed to throw off the tire.



In putting on the tire place the tire on rim, seeing that the beads at valve stem are securely in their place then screw lock nut on valve stem and tighten. Put tire on as far as possible, then proceed with the tool.

Manufactured by the Marquette Manufacturing Company, Incorporated, St. Paul, Minn.

Red Arrow Circulating Pump has been developed to aid the thermo-syphon cooling system of the Ford car. The pump is of the centrifugal type and it is said to insure a complete change of water in the cooling system every 20 seconds, with the engine running at the rate of 15 miles an hour. The pump starts operating the instant the engine turns over and continues as long as the engine is in operation.

This circulating pump is substantial throughout and built for real service. As it runs in water the steel shaft is well lubricated and the heavy bearings of cast bronze prevent the possibility of rusting and insure permanent alignment. To insure absolute accuracy the surface fastened to the motor is machined exactly parallel with the shaft.

The extra long bearings are said to prevent side motion, with the resultant wear and leakage of the stuffing boxes



and the impeller blades. The blades of the impeller are so shaped that no resistance is offered to the thermo-syphon system when the pump is idle. The manufacturer states that once this pump is in-

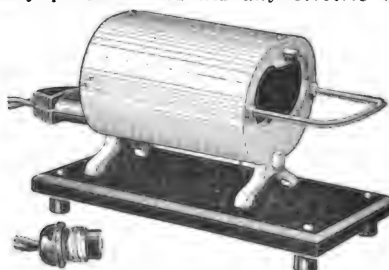
stalled there is no vibration or leakage of any kind.

A belt is included in all cases, unless otherwise instructed. The accessory is packed in an individual carton for shipping.

Manufactured by the Fulton Company, Milwaukee, Wis.

Friz Electric Furnace heats any size soldering irons, melts babbitt for bearings and tempers tools or heat treats metals. It is convenient, efficient and durable. It stays hot at a cost of less than five cents an hour and eliminates fire danger. It is easily portable and fits any electric wiring socket. One or two irons may be used at the same time. The furnace is made for 32, 110 and 220 volts. Current consumption of model A is approximately 240 watts and model B 400 watts. It is sold under a positive guarantee. Prices and other information on request.

Manufactured by the Friz Manufacturing Company, Indianapolis, Ind.

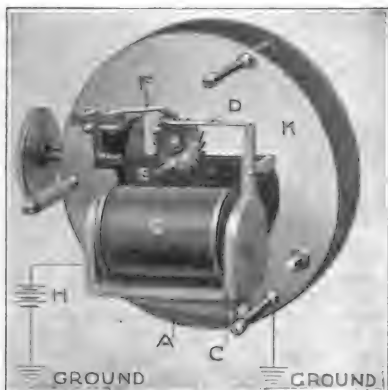


Wodack Portable Electric Drill and Grinder is said to fill a long felt want in shops or factories where there is not enough of either hand drilling and grinding operations to warrant purchase of two separate machines. The tool is designed so that by the use of one motor it has the desirable speed for drilling, as well as the proper speed for grinding.

Manufactured by the Wodack Electric Tool Corporation, No. 23 South Jefferson Street, Chicago, Ill.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

Keith Landis Electric Clock needs no winding as it does not contain the conventional mainspring. By referring to the accompanying drawing the action of this clock is readily explained. A spiral spring (a) pulls the armature (b) so that the driving pawl (d) drives a non-conducting ratchet wheel (e) in a clock-wise direction. The driving pawl (d) and the holding pawl (f) press downward on the ratchet wheel (e). When the ratchet wheel turns through the length of one tooth the holding pawl (f) drops from the top of the tooth and makes contact with the driving pawl (d), thus completing the



circuit from the battery through the magnet (g). The magnet (g) being energized by the connection attracts the armature (b), pushing the driving pawl (d) over the top of the next tooth in the ratchet wheel. The driving pawl (d) then drops to the bottom of the tooth (f), is held at the top of the tooth and the circuit is broken. The spiral spring (a) then pulls the armature (b) back to position and the entire cycle is repeated.

The turning of the ratchet wheel (e) as explained above, drives the power shaft, which is geared to the center wheel of the watch movement, thus making the clock automatic when a small amount of electricity is supplied to the windings.

These clocks have proved so accurate that the manufacturers issue with each one sold a Fidelity and Casualty Company policy, insuring accuracy to the satisfaction of the user.

Sold by **Thomas O'Brien & Coleman, Incorporated**, 165 East Erie Street, Chicago.

Laco Piston Ring is claimed to instantly reduce friction and afford just the result the motorist desires to make motoring a real pleasure at all times. It was originally developed for use in a locomotive throttle valve, where one ring is required to seal 200 pounds standing pres-



sure at one time. The Laco Piston Ring has now been perfected to meet the most exacting requirements of the automobile engine.

The Laco Piston Ring keeps the seat line unbroken at all times through the use of a diagonal-cut ring placed within a step cut ring with opening opposite each other, absolutely preventing the passage of compressed gas. Both the oil and gas strike an absolutely tight wall, exactly as shown in the illustration. Compression is held indefinitely, through the flexibility of the Laco Piston Ring.

The economy feature of this ring should appeal to the automobile owner, as

the Laco ring is claimed to effect a great saving in gasoline, by holding compression; in carbon removing cost; by eliminating the carbon and in oil by keeping it from combustion chamber.

As a sure indication of the confidence of the manufacturers in the efficiency of their product, the Laco Piston Ring is sold with a full money back guarantee in case of any dissatisfaction.

Manufactured by the Laco Piston Ring Company, Toledo, O.

Blettner Power Reaming Machine is operated by a small electric motor placed near the assembling bench and is claimed to do away with the antiquated "strong arm" or manual methods of hand reaming.

By expediting the reaming of finished holes where sizing is essential they improve the quality of the work, reduce the handling charges, save time and the tedious, slow and intermittent work of turning the reamer by hand is eliminated.

The reamed hole produced by a steady power drive is smoother and better finished, of greater accuracy and consequently longer life.

Only 1/6 horsepower is consumed when the machine is used. The gearing of the head is so designed that this force is sufficient to handle reamers as large as 1 1/2 inches.

It is a sturdy, well built machine. All parts are thoroughly safe guarded, read-



ily accessible, enclosed to retain oil for lubrication and the machine is self-contained.

A pedestal of the vertical type carries the driving motor, which is belted through a three-speed cone to a self-locking worm gear reduction which rotates the chuck carrying the reamer.

The operator stands directly in front of the reamer and holding the work free-hand (floating holder) feeds it on to the slow turning reamer (which centralizes itself) with the fastest possible speed, producing better results than with rigid fixtures.

These machines are built and marketed by **Geo. H. Blettner Company**, 1841 W. Jackson Boulevard, Chicago, Ill. Price, \$195 f. o. b. Chicago.

Wefco Spring Cover affords protection of the springs of the car from everything in the form of water, dust and dirt. By

doing this it prolongs the life of the springs themselves, eliminates annoying squeaks and adds materially to the riding comfort of passenger.

Car owners who have had disagreeable experience with springs whose leaves have become rusted will find much to interest them in the Wefco leather spring cover. The maker states this device has been on the foreign market for approximately three years, during which time ample opportunity has been provided for testing its merits.

The Wefco cover encloses the spring and guide from clip to shackle. One of its features, upon which considerable emphasis is laid by the maker is a system of invisible fastening. Underneath the fastening, a tongue of leather runs the full length of the cover so that there is double protection throughout and the cover cannot wrinkle.



Still another feature worthy of mention is the leather flanges or tubes on both sides of the straps. These flanges grip the ends of the spring tightly when the cover is buckled up and prevents water, dirt and dust from reaching it.

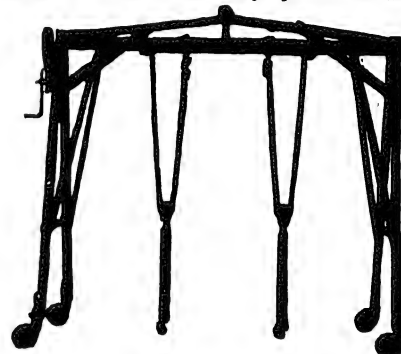
The covers are laced with a specially prepared cable cord, durable and damp-resisting. The leather used in the production of the covers also is specially treated for the purpose, the right proportion of grease being worked into each hide. Each cover is strained onto the spring and as a consequence is said to fit snug and tight and present a neat appearance.

In regard to lubrication, before fitting the covers the springs are well smeared with a suitable grease, two pounds being sufficient to keep the springs in excellent condition indefinitely, as the lubricant is retained between the leaves. With each set of covers a card of complete fitting directions is supplied together, with a needle for threading the lace, the latter making the fitting simple and speedy.

Manufactured by the Wefco Company, 439 West 41st Street, New York, N. Y.

The Manley Portable Hoist is claimed to have demonstrated its adaptability to garage service work on account of its stability. The outstanding feature of the Manley Hoist is the positioning of the chains anywhere between the uprights, so that they always lift the load vertically.

Both chains on the Manley Hoist may be instantly located at any point between



the upright frames, for taking out motors, elevating bodies or removing axles, etc. This is done by pushing the chain winding drums, which are suspended from a trolley on a hexagon shaft along the upper frame.

The chains may be used single or double, giving in the first case twice the speed with one-half the leverage, and in the second case the reverse, thus proportioning the leverage to the power required to efficiently and quickly lift any load.

Manufactured by the Manley Manufacturing Company, York, Pa.

(When Writing to Advertisers, Please Mention the Automobile Journal.)



"**Racine Junior**" is a high speed, metal cutting machine that uses light gauge blades at high speeds. This is made possible by a positive mechanical lift on the non-cutting stroke. The reason why such lift must be absolutely positive, is manifest, when it is explained that unless free clearance to the blade on the back stroke is given under all pressures, the blade drags back, heats, bends and binds in the cut; teeth of blades are then quickly worn off. Under a microscope it will be discovered that chips from the "Racine" machine are curled as though turned from a lathe, showing that the blade is not dragging back on the work.

To sum up—this machine can use light gauge or hand blades at a high cutting speed. The thinness of blades combined with rapid stroke make possible a production of about double that hitherto obtained. Hence unusual economy in blades, time and material.

The "Racine" Junior is a very moderate priced machine—designed for the average shop—small or large.

Manufactured by the Racine Tool & Machine Company, Racine, Wis.

Telltalite is a coil and pilot light to be connected with wiring system of any stop signal and indicates at dash whether or not signal is operating.

It is claimed that the pilot light shows just when the signal comes on, remains lighted while signal is lighted and shows



just when signal goes out. It therefore is a means for preventing confusion and waste of current in case the signal does not cut out when brake is released.

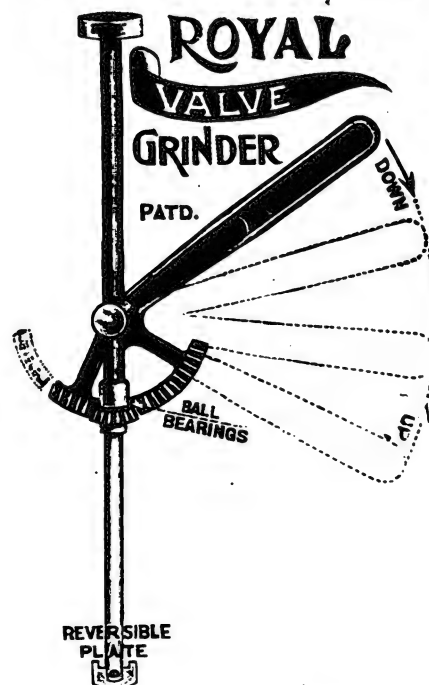
If pilot lamp turns out, which may happen, signal will not be interrupted, but failure of signal for any reason will be shown at dash.

Telltalite coil can be applied to tail light dash light and indicates whether or not tail light is burning.

Manufactured by Potter Specialty Company, Chicago, Ill.

Royal Valve Grinder grinds valves by a natural easy up and down pump motion. The full stroke of the handle revolves the valves 1 1/2 complete turns and back. There is no danger of cutting the face of the valve as the cutting work can be felt at all times. The long shank and handle with which it is equipped allows the grinding operation to be completed without interference from obstructions on any motor.

The manufacturer states the grinder is made of the best high grade material throughout its entire construction, it also being equipped with ball bearings, which insure easy action and prevent any tendency toward binding. A valve spring is



furnished with each grinder, which is to be placed beneath the valve being ground. When the hand pressure is removed this spring raises the valve for inspection or for the replenishment of the grinding compound.

The grinder is very compact and requires little space for storing. When not in actual use it is easily supported by an ordinary nail. It is claimed the valve grinder never stops twice in the same place when in actual operation.

Sold by the Universal Equipment & Supply Company, 109 North Franklin Street, Syracuse, N. Y.

(When Writing to Advertisers, Please Mention the Automobile Journal.)



Boyce Moto-Meter and Parking Lamp is an indispensable indicator for the night driver, as it enables the motorist to discern clearly at all times any indication of engine trouble. In addition it may be used as a parking lamp, showing a red light to the rear and a white light to the front. When driving an ingenious shutter keeps the red light invisible.

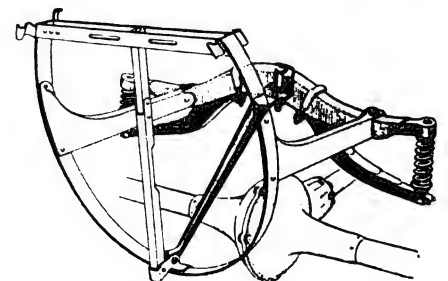
When used as a parking lamp the Moto-Meter reduces the drain on the battery from three lamps to that of a one, two candle power bulb. Another feature which greatly increases its utility is a rear view, reducing mirror, which enables the car driver to foretell the approach from the rear of any vehicle.

This accessory is light and durable and may be attached to any car either open or closed models. In workmanship and design it harmonizes perfectly with the appearance and adds materially to the attractiveness of any car. It is made of brass, durably finished in nickel and black.

Included in the equipment are three brackets, making the lamp adaptable to any car, six feet of weather proof wire, for making the necessary connections and a single pole, Connecticut type, push and pull switch, finished in nickel, for mounting on the dashboard.

Manufactured by the Moto-Meter Company, Incorporated, Long Island City, N. Y.

Ford Necessities Company's Tire Carrier Support is said to be meeting with considerable favor by Ford car owners, as it adds just the necessary strength to brace up and stiffen the tire carrier, to guard against vibration and possible breakage. It is very easily put on by the owner,



as all one has to do is take the nut off the spring, tie bolt, slip the brace over the bolt and put the nut back. It is claimed to be very strong but light, weighing only six ounces, and made of magna metal.

Manufactured by the Ford Necessities Company, 7 East 42nd Street, New York.

Casey Automatic Windshield Wiper is said to have met with genuine approval, on account of its simplicity of construction and installation.

A small vacuum motor operates from the vacuum tank or intake manifold. It is powerful enough to clear a generous arc of the windshield and keep it clear during the hardest rain, snow or sleet storm.

A small thumb screw adjusts it to operate at any speed desired. It is easily and quickly installed on any type of car, open or closed, by drilling three small holes



through the windshield frame and inserting screws furnished with the outfit. The connection to the intake manifold or the vacuum tank is through a small flexible rubber tube.

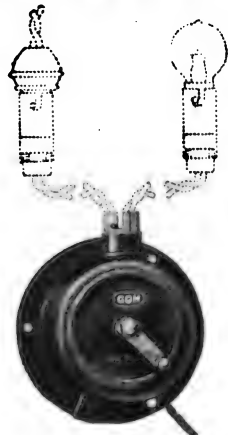
The maker states that this windshield wiper costs only a little more than a good hand-operated cleaner and will last for the life of the car. By turning a button the cleaner starts to operate. It affords a clear view of the road—constantly—and leaves both hands free for the careful operation of the car.

Manufactured by the **Casey-Hudson Company, 361 E. Ohio Street, Chicago, Ill.**

Reellex, a new extension reel trouble light is claimed to meet a certain demand for a neat, compact, reel light, that is always convenient to get at, and not unsightly if mounted in plain view.

It is said that it can be mounted in the tonneau, as a dome light, in the rear compartment of coupes and roadsters, and will not look out of place.

There is an extension cord about 12 feet long in the reel, which will enable



one to reach anywhere around the car, and it requires only an ordinary standard double contact bulb. When mounted on the dash it is claimed that this reel can be connected by using an attachment plug to any detachable spotlight, permitting the light to be carried to any part of the car.

The reel is furnished in black enamel and nickel trimmed, complete with switch to control light.

Manufactured by **Grigsby-Grunow-Hinds Co., 906 W. Lake Street, Chicago, Ill.**

Fritz Wheel and Gear Puller is designed for general garage work and is made in four sizes to fit the smallest generator bearing or the largest truck wheel. It has a straight line pull. The power screw it is stated is $\frac{1}{4}$ -inch in diameter, with a No. 14 thread at the arms. High carbon drop forgings are used in the construction of the arms, which insures strength and uniformity. Rivets and pins are of the same carbon steel. The body is an electrical steel casting having three



inches of thread, which eliminates stripping. The capacity is 0 to 18 inches in diameter and 0 to $9\frac{1}{2}$ inches in length. The adjustment is practically automatic and a locking device eliminates excessive gripping power. Weight $12\frac{1}{2}$ pounds. Pulling power, 20 tons.

Manufactured by the **Fritz Manufacturing Company, Indianapolis, Ind.** Prices and other information on request.

Jon-Con Tire and Tube Protector, which is now in use in all parts of the United States and Canada and many foreign countries as well, involves a new theory. A few unenlightened garage and accessory men still cling to the old idea that protectors are for use only in old casings. Jon-Cons were especially designed for use in new or good casings. They are made of one continuous moulded piece of firm elastic, reinforced, and are placed on the inside of the casing between it and the inner tube. This extra rubber naturally takes up some of the air space, which means that less air is needed in the tube, providing greater resiliency and, in consequence, an easier riding car.

The principle reason for casings prematurely going to pieces is that the fab-

as it cannot mend the fabric in an old casing after it is once broken.

Jon-Cons are longer in circumference than the casing, so that when installed they are compressed into place, not being stretched as the tube and casing are, which is the puncture-proof feature of the device. When a nail pierces the casing, which is stretched, it strikes the protector, which is compressed, and the force of the blow being greater than the resistance, causes the protector to spring in, thus forming a vacuum, as the air in the tube behind is not solid. The next revolution of the wheel bends the nail between the protector and the casing, thus preventing it from doing any harm until it can be removed.

Jon-Con Tire Protectors combine the merits of being easily installed without the use of cement or tools, do not tear in service, successfully reinforce the tire carcass and can be transferred from one casing to another as the old ones finally wear out.

Manufactured by **Jon-Con Tire Protector Company, Philadelphia, Pa.**

Inner Control Spotlite is claimed to eliminate all discomfort and inconvenience in operation, being always within reach, inside of car. It is not necessary to loosen curtain or lower window



to control the light.

It is rust proof, as all parts are made of phosphorus bronze heavily nickel plated, or aluminum highly polished, and is noted for its rigid construction and adaptability to give good service in actual operation.

The Spotlite is an achievement in both neatness of appearance and strength. The



beauty alone is sufficient to place it among the foremost spotlights it is stated.

It is guaranteed to give perfect satisfaction or your money refunded, and it is claimed one will last as long as the car on which it is installed.

Manufactured by the **Cincinnati Lamp and Bracket Company, Cincinnati, O.**



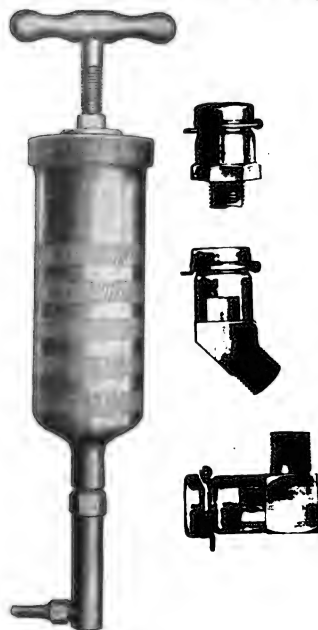
ric is broken or damaged, due in most instances to a stone bruise or other sharp abrupt bend. This is where the Jon-Con protector does part of its work, for the reinforcement which it gives acts as a shock-absorbing bridge on the inside of the casing, thus distributing the peak of the blow to a wider area and saving the fabric from breaking. The logical reason then for installing it in a new or good casing is that it may protect the fabric from breakage, the result of which is increased mileage many times over, where-

(When Writing to Advertisers, Please Mention the Automobile Journal.)

Bowen Empress High Pressure Lubricating System is claimed to be a practical and effective system of lubrication which satisfactorily meets all requirements. Among the principal features are that it is said to effectively handle all grades of grease or oil; one hand operates it and it may be used under pressure or gravity system. It is convenient to handle, simple to operate and cleans and lubricates all working parts of the entire chassis.

It is sturdy of construction, of practical design and provides a positive, quick, easy and clean method of lubricating the car or truck.

One hand operates it. This feature is appreciated when lubricating the more inaccessible bearings. Ample pressure is developed in the gun before applying to the connection, then as the gun nozzle is



thrust into the connection a valve automatically opens, releasing the pressure and the resulting explosive action forces the lubricant into the bearing under high pressure.

It cleans and lubricates. The explosive action by which the lubricant is shot into the bearing effectually cleans it. All dead grease and dirt which may have accumulated is driven out before an instantaneous flooding of the bearing by a charge of the lubricant shot in under high pressure, leaving the bearing covered



with a film of fresh lubricant.

This gun is drawn from sheet metal and built to withstand hard service. The connections are turned from brass rod and fitted with spring covers easily opened and closed with the gun nozzle. The covers cannot be lost and are always in place on the connections. They revolve, making it easy to lubricate from any position. The spring shackles, steer-

ing spindle and tie rod bolts are carefully heat treated to insure the maximum amount of wear.

Manufactured by the Bowen Products Corporation, Auburn, N. Y.

The Eastern Machine Screw Corporation, manufacturers of the well known H & G Self-Opening Die Heads, is placing on the market a new socket and ratchet wrench set, designed to meet the demand for a wrench set possessing strength, practicability and finished appearance.

The manner in which the sockets are made is one of the features of the set. One practise to obtain the hexagon is to drill a hole having a diameter the same as the measurement across the flats and then broach this hole to a hexagon. The corners are produced by forcing the metal



outwards. This sets up strains which can only be offset by making the walls of the sockets thicker.

The hole for the hexagon in the H & G socket is drilled to diameter of the diagonals—the distance from corner to corner—a considerably larger hole than that used in the broaching process. The metal is then drawn in to form the hexagon, which condenses and toughens the metal.

The head of the socket is a hexagon and the various units of the set fit over this head, affording better purchase than that afforded by inserting a square hole in the head of the socket.

The sockets are heat treated and hardened by a special three-stage process. First, carbonization; second, refining; third, hardening. Exceptional strength and durability is claimed for the sockets. Special care is taken to have the sockets fit the nuts accurately.

The set is packed in an attractive hard wood box with a place for each part and consists of 10 sockets, an adjustable T handle, reversible ratchet, extension piece, universal joint milled from bar stock and two screw drivers. All of these units are specially heat-treated, hardened and finished. A drop-forged box wrench, hardened by the cyanide process, is also included for use where head room is not sufficient to allow the use of the other tools.

Each female part of the wrench attachments has a split screw made from spring steel, which furnishes the proper friction to hold the different parts together while in use.

Manufactured by the Eastern Machine Screw Corporation, New Haven, Conn.

Esta-Brite, a superior auto and furniture polish is no new product, however it has proven its worth to those who have

been fortunate enough to be able to get it. It not only polishes, but cleans as well. It is wonderfully efficient as a renewer to old leather upholstery. It is used on display cars, service cars and by demonstrators of leading manufacturers, who recommend it highly as a preservative for the original finish.

It is indispensable to the housekeeper who takes pride in the appearance of her furniture and wood work. It cleans and polishes white enameled furniture and wood work as efficiently as other finishes, and is a peerless cleaner of enameled



beds. Being manufactured exclusively from liquids and containing no alcohol, benzine, turpentine or other varnish removers, it cannot scratch or injure the highest finish. There is no danger of soiling the most delicate clothing by contact with surfaces properly treated with Esta-Brite. It is used in the finest homes and hotels.

Esta-Brite is the result of years of experimenting and was perfected by C. H. Estes, who is now president.

Manufactured by the Queen City Specialty Company, Cincinnati, O.

Monogram Automatic Locking Radiator Cap is a radiator cap which makes it possible to fill the radiator without removing anything from the car. It also is claimed to prevent any thief from stealing the Motor-Meter without the necessity of keys or locks to prevent it.

The Monogram Cap is steam and water tight and screws on like an ordinary cap, but it does not screw off without the

MONOGRAM The Automatic Locking Radiator Cap



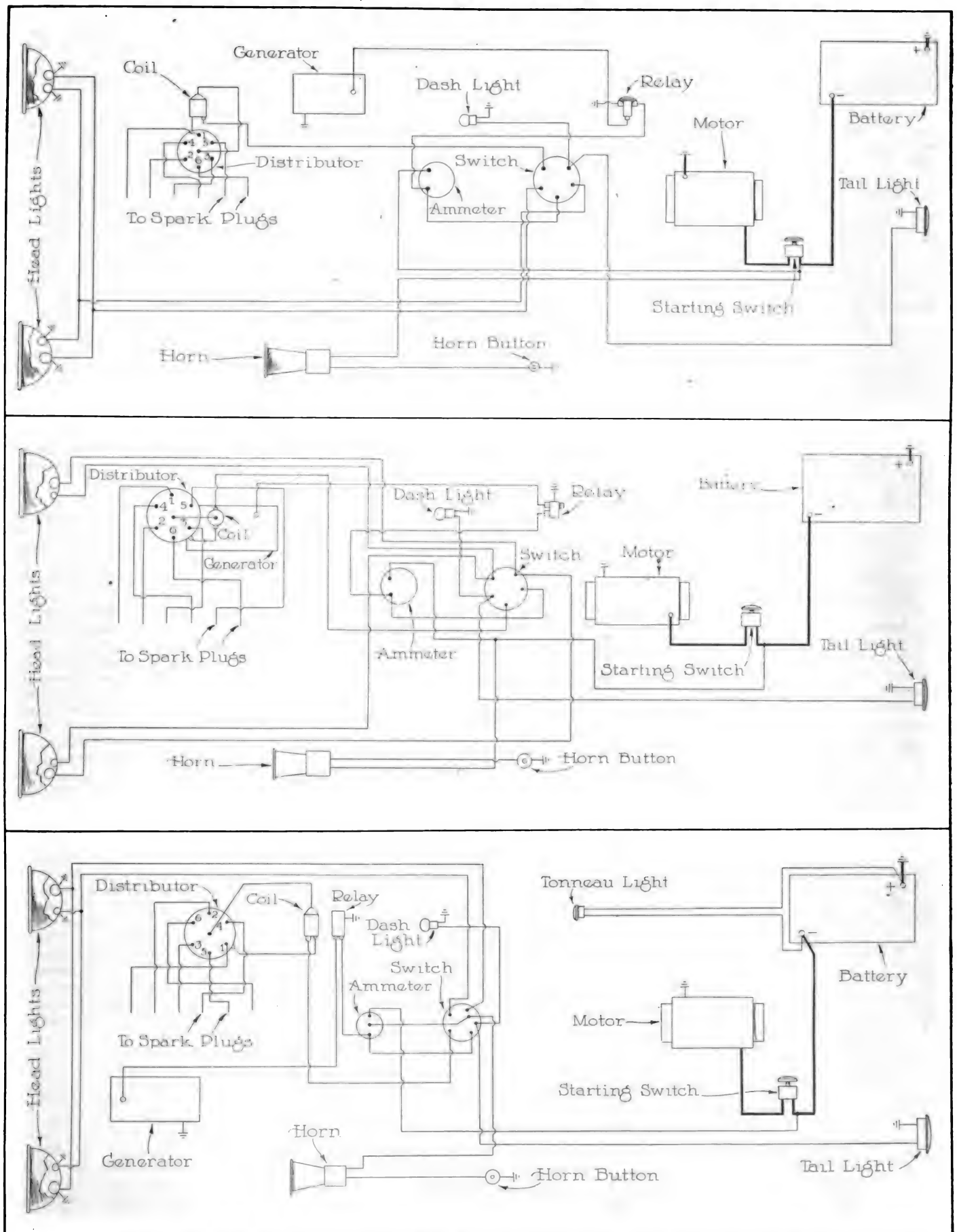
drastic use of shop tools. The motorist's lodge emblem or personal initial may be placed on the cap in a tasteful design of metal sculpture appropriate for the best cars.

It is a highly finished article of clever workmanship and is claimed to be simple and durable, making it possible for anyone to attach it.

Manufactured by the General Automotive Corporation, Wrigley Building, Chicago, Ill.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

Monthly Wiring Diagram, No. 27



Top—Liberty Model 10B, 1919, Six-Cylinder, Double Bulb, Battery Ignition, Single-Wire, Two-Unit System, Separate Circuit Breaker. Center—Liberty, Model 10C, 1920, Six-Cylinder, Battery Ignition, Single-Wire, Two-Unit System, Separate Circuit Breaker, Positive Connector Grounded. Bottom—Nash, Six-Cylinder, Model 681, 1918-19, Two-Unit System, Single-Wire, Positive Connector Grounded, Separate Circuit Breaker.

LEGAL POINTS

By SAMUEL WANT

SOMETHING of the historical development of vehicular traffic frequently crops out in connection with the many legal problems arising out of the use of automobiles. Note, for example, this interesting situation as disclosed by a recent decision of the Supreme Court of New Hampshire.

In the state named a toll bridge company was incorporated in the year 1795. Its charter expressly provides the scale of charges for traffic passing over the bridge and under the law it is limited strictly to such charges. The schedule thus provided sets out the various forms of traffic then in vogue, including pack horses, hand barrows, or ox teams, two-wheel passenger carriages and "carriages for burthen," but the wily legislator who drew the charter lacked the prescience to foresee the new forms of conveyance that future generations were to develop.

An ingenious tourist who was aware of this gap in the scale of charges refused to pay the tolls required of automobilists for passage over the bridge. Insisting that the imposition of such charges was an enlargement of the charter scale made without the legal authority which is necessary to effect a change in a corporate charter.

But the law is elastic; that is the judicial way of expressing the popular idea of stretching the law. The court held that as to passenger automobiles the provision of the charter covering "four-wheel carriages for passengers" is applicable, although admittedly this provision was expressly intended to cover horse drawn vehicles. As to automobile trucks, the court decided that they must be held to be subject to the charges provided for "carriages for burthen drawn by two or four beasts."

Query—Will the charter stand another null to cover the case of aeroplane traffic?

SOME solace for public officials who, barred from the helpful tactics of the labor unions, find themselves losing out in the fight with Mr. H. C. L. is found in a recent New York case. In New York, as in almost all other states, there is a constitutional inhibition against granting extra compensation to public officials during the term for which they were elected or appointed. In one of the counties the superintendent of roads was provided with an automobile at public cost for the purpose of facilitating the performance of his duties. Payment for the car was refused by some officials concerned with the approval of expenditures on the ground that the

transaction was tantamount to the granting of extra compensation to the road officer. But the court decided otherwise and directed that payment be made.

THE evidence in a recent Florida case showed that the last note due under an installment contract for the sale of an automobile was not paid on the due date. On the following day the account was placed in the hands of an attorney with instructions to reclaim the car. The contract provided for the payment of an attorney's fee if the note was not paid at maturity and was placed in the hands of an attorney. On the same day that the attorney received the claim the seller received the debtor's check in payment of the note. It was not certified. The seller refused to accept the check, demanding that the attorney's fee be paid also. This the purchaser refused to pay, but he offered no explanation for his delay of one day in making the remittance. While the default was thus one of purely nominal duration, the court held that the contract requirement was enforceable, so that the debtor either had to pay the attorney's fee or surrender the car.

AMONG the very recent decisions is one of especial interest to dealers who sell cars and truck attachments on the partial or time payment plan. A Ford was purchased on the partial payment plan, a mortgage or its equivalent being given for the unpaid balance at the time of purchase. While the mortgage remained unpaid the owner purchased one of the well known truck attachments and by means of it converted his passenger machine into a truck. The attachment was likewise purchased on the partial payment plan, and a mortgage was given on the car as reformed, covering the unpaid balance due on the attachment. The payments on the attachment were not kept up, and when the seller attempted to enforce his mortgage he was met by the claim of the holder of the first mortgage, who maintained that his mortgage covered the car not only in its original condition, but also in any changed or improved condition in which it might be put while the mortgage remained in force. The court decided, however, that the seller of the truck attachment could detach and reclaim it, though as a general rule a mortgage on personal property includes improvements placed upon it in the course of its use for its usual purposes.

EVERY now and then some minor judicial officer, concerned more or less with the enforcement of automobile regulations, feels an impulse to warn the public of the incorrigible ruthlessness of all automobile owners, and

the consequent necessity of penalizing them heavily for all automobile accidents involving violations of law. In several states these worthy officials have secured considerable support for a measure that will penalize the owner of a car which has been involved in an accident, if a violation of law is established against the driver, regardless of the presence of the owner in the car at the time, or of his knowledge of the accident or consent to any act contributing to it. Mark you, we are speaking of criminal penalties, not compensation to injured persons.

Entirely aside from constitutional objections the injustice of such a measure is patent. Recklessness and lawless tendencies cannot be cured by vicarious punishment, and there is hardly room for the argument that chauffeurs will be made more careful by reason of the criminal responsibility of their employers for the acts of the former.

To the extent that it is desired to prevent owners from escaping responsibility for the acts of their chauffeurs which they connived at, encouraged or passively permitted, there is, perhaps, ample room for broadening the scope of the present law.

Prior to 1917 the Canadian law was almost as broad as the one now in question. In the year named the law was amended so that the owner's criminal liability was remitted upon proper proof that he was not driving at the time the violation of law occurred, and that the one who was driving his car at the time was doing so without his consent. This still leaves the owner responsible for violations of law committed in his absence when the car is being used with his authority or knowledge, but as to such cases it is expressly provided that the owner shall not be liable to imprisonment.

UNDER the bankruptcy law an unrecorded mortgage is not recognized, and property covered by such a security will become a part of the general assets for distribution equally among all creditors of the bankrupt. On the other hand a pledge which involves delivery of personal property by a debtor to a creditor as security is recognized by the bankruptcy law.

These rules were applied recently in a federal decision in which it appeared that a bank loaned money on certain automobile trucks which were delivered to it as security. The bank also took a mortgage on the trucks, but the mortgage was not recorded. The debtor became a bankrupt, and his creditors claimed that the trucks were a part of the assets for general distribution, while the bank claimed the trucks as exclusive security for its loan. Under the rule above stated the bank's claim was sustained.

AN ILLUSTRATION of the rule that the negligence of people in the highways will not excuse a motorist who fails to exercise due care to avoid the consequences of such negligence is furnished in a recent decision of the Supreme Court of Connecticut. The facts of this case show that a party of motorists were engaged in replacing a tire on their car and that at the particular place the road was so narrow that a street car would necessarily strike them in passing, unless they got out of the way. It was a very dark night and a street car did come along and strike the party, causing injuries to all of them. The testimony showed that the trolley car carried a light which was effective for only 15 feet ahead, while the car moved at a speed which required a space of 100 feet within which to stop. The court held that, notwithstanding the negligence of the claimants, the accident could and should have been avoided by the use of lights on the trolley car adequate to the conditions under which it traveled, and that therefore the car company was liable for the injuries.

IN A VERY recent case the Supreme Court of Massachusetts was called upon to decide whether a corporation whose stock was owned and controlled by one man had a legal existence apart from that of the man. The suit disclosed that a claim had been prosecuted without success against the corporation for injuries sustained in an accident in which an automobile truck owned by the corporation figured. At the time of the accident the truck was being driven by the man who owned the corporation. The present suit was brought against said man, who maintained that he and the corporation were one, and that therefore the verdict in favor of the corporation in the prior suit settled the issue in his favor, too. In the opinion of the court, however, that is not the law and the claim was sustained.

IN A VERY recent decision rendered in Pennsylvania it was held that the negligence of the driver of an automobile in crossing railroad tracks without first looking and listening for oncoming trains is imputable to a passenger in the car as a matter of law, so that, even assuming the negligence of the railroad company in a given case, a claim or the death of a passenger in an automobile under the circumstances stated is not even entitled to go before the jury for their consideration. This is contrary to the decisions in almost all other states.

Of course where a passenger in an automobile controls the actions of the driver, the latter's negligence is a bar to a suit by the former if an accident occurs. For example, as shown in a recent New York case, where a fire chief is driven in an official car by a fireman, the former directing the latter during the trip, both are prevented from maintaining suits against another motorist with whom they collided, where the accident was due to the joint negligence of the drivers of both cars.

IN A RECENT Georgia case a reckless motorist learned that the refinements of the law play havoc with the popular conception of the cost of subordinating the safety of pedestrians to the transient pleasures of speeding and of other species of violations of the rules of common sense and law relating to the operation of motor vehicles. The pedestrian injured in this case was a married man. His injuries did not appear to be serious and he claimed only \$500 as damages. While his suit was still pending in court he died. His wife was appointed to administer upon his estate and she prosecuted the damage suit to a conclusion for the benefit of the estate. A verdict for \$500 was obtained and the amount was paid to the wife as administratrix.

Subsequently the wife brought suit against the motorist on her own account. She claimed that her husband had died as a result of the automobile accident, and she demanded damages for her consequent loss of the support and companionship of her spouse. The motorist's defense was that only one suit at law can be brought for the same cause, and he insisted that the damages paid by him in the first suit discharged his liability for the accident. As the court pointed out, however, liability for an accident extends to all natural consequences of it. The first suit was solely for the benefit of the estate. A verdict upon his death his claim was an asset of his estate. His widow's claim for her loss did not accrue until his death. Hence it could not be barred by the settlement in the first suit.

The forfeiture provisions of the state laws relating to the unlawful transportation of liquor by automobile continue to be featured in the decisions of many states. In Alabama this class of litigation has taken the lead over such former favorites as divorce cases, murder trials and the like, and in other southern states it has attained equal prominence, though competing with perhaps a less vicious line of outstanding litigation. One of the very latest decisions comes from the Supreme Court of Georgia. In this case an automobile was loaned by its owner to his son to be used as a jitney. The son took out a jitney license in his own name and retained all of the proceeds of his business. The car was impounded by the sheriff and found to contain a large quantity of whiskey. Proceedings were instituted for the forfeiture of the car and the father interposed his claim of ownership of the machine, contending that he had no knowledge of the unlawful use made of it. The father's claim was sustained by the court and the machine was ordered returned to him. Of course, the claim of the prosecuting authorities was that under the above facts it was only reasonable to assume that the father had full knowledge of the use being made of his car. If, indeed, he had retained any interest in the car at all. But the court refused to draw this inference.

INSTALLMENT contracts and chattel mortgages covering automobiles usually contain a provision entitling the creditor to declare the whole indebtedness due at any time, and to retake the

car if the full amount due is not immediately paid, where he reasonably believes that the debtor is causing or permitting the value of the car as security to become impaired, by improper use or abuse of the same. In construing such a provision the courts require a strict adherence to the terms of the agreement. If the creditor retakes the car without reasonable cause, or, having reasonable cause, fails to demand payment of his debt before retaking his act is unlawful, and he may be held liable in damages. This decided very recently by the court of civil appeals of Texas.

AMONG the classes of debts which are not obliterated by a discharge in bankruptcy, are those arising from the commission of wilful and malicious injuries. In a recent Georgia case a motorist secured a discharge in bankruptcy after an accident in which his car collided head-on with another car. According to the dissenting opinion filed by one of the judges the evidence showed that the motorist in question and another were approaching in their cars from opposite directions; that the former held his course near the middle of the road, although there was ample room for him to turn out and a suitable roadbed on his right; that his car was much larger than the other; and that after the accident he continued on without stopping.

A majority of the court, without discussing the matter, held that these facts do not show a wilful and malicious injury so as to save the injured motorist's claim from the bankruptcy discharge.

Answers to Questions.

Q. Can you furnish any authoritative decisions covering the right of a state to tax an automobile stored in the state, where the owner resides in another state?—F. L. S.

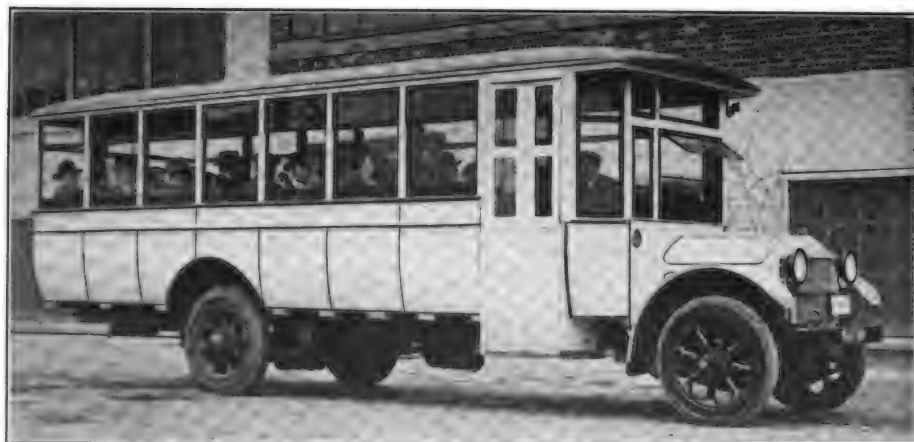
A. You will have to give me some of the details of the particular case you have in hand to enable me to give you references to decisions exactly in point. Is the car stored temporarily or for a definite and prolonged period? What is the ultimate purpose in view—to sell the car in the state where it is located, to have it repaired there, to meet personal convenience, because of proximity of residence, or in view of some particular future use of the car?

The general rule of law governing the broad question of the taxation of automobiles of non-residents which happen to be in a state may be stated as follows, though slight circumstances may require the application of qualifying rules in particular cases:

A state has a right to tax property which is definitely and permanently located within its borders regardless of the place of residence of the owner. "Permanently" does not have its popular signification, but refers to a present purpose to leave the car in the state without an intention to limit its location there to some temporary object.

Have you any legal questions that are puzzling you? Send them in to the Automobile Editor. The service is free and you may rely on its authenticity.

AUTOMOTIVE DEVELOPMENTS



A Bus That Has Made Good Wherever Installed.

Garford City Bus

Specifications.

SEATING capacity of this Garford bus is from 25 to 29 passengers. Frame is of the low loading type, being but 25 inches from the ground. Body mounting is made more rigid by increasing the width. Special wide tread tires are used, which greatly reduce the possibility of skidding. Riding qualities are greatly enhanced by equipping the bus with extra long and flexible springs. The engine is of special design, having a wide range of speed, and is readily accessible.

Road Building Tractor

Specifications.

THIS Allis-Chalmers Tractor has rated brake H. P. at normal engine speed of 35 and a rated drawbar H. P. of 20. Normal speed of motor 930 R. P. M. Engine has four cylinders, cast en bloc, a stroke of $6\frac{1}{2}$ inches and a bore of $4\frac{1}{4}$ inches. The diameter of both the exhaust and inlet valves is two inches, these valves having cast iron heads, the stems made of carbon steel. Crankshaft is supported by three main bearings. Pistons are cast iron of very light construction.



The Allis-Chalmers Tractor Handles All Road Jobs.



Unusual Accessibility Is Claimed for This Speedster.

Gramm-Bernstein

Specifications.

THE Gramm-Bernstein pioneer speed truck has a wheelbase of 129 inches. Tires front and rear 35x5. Power furnished by a high speed engine having a stroke of five inches and a bore of $3\frac{1}{4}$ inches. It has an S. A. E. H. P. rating of 19.6. Connecticut ignition is used with an automatic circuit breaker to prevent battery exhaustion. The clutch is a 10-inch dry plate type. Transmission has three speeds forward and one reverse, final drive being through bevel gears.

DRIVE CAREFULLY!

MOST automobile accidents are due to a lack of a little common sense and carelessness in complying with a few simple driving rules. Accidents are as liable to happen to the seasoned driver as to the driver who has only had his car for a short time.

1. First assume that you must look out for yourself and the other fellow, too. Do not rely wholly on the other fellow doing the right thing, and you will be on your guard if he does the wrong thing.

2. Never back or swing from the curb into the street without looking back to see if the way is clear.

3. Glance both ways on each cross street, and if you are not on the main thoroughfare, slow down before you cross. It is safest to drive slowly enough to have the car well under control where buildings hide intersecting streets.

4. Do not cut the corners in turning but keep to your side of the street and look both ways before you make the turn.

5. Put out a hand as a guide to the car following or approaching.

6. If passing a slower vehicle pass on your left, but in passing a street car, always keep to the right.

7. Do not follow another vehicle too closely. It might stop suddenly.

8. Stop when the street car ahead of you stops and stand still till all of the passengers getting off are on the street. It's better to be safe than it is to be sorry.

ONE OF THE SEASON'S BEST

THE Paige line for 1922 includes a new series of the 6-66 models perfected and refined, and with many additions in equipment and appointments,

tain distinction and exclusiveness, yet who must give special consideration to economy of first cost.

The new series 6-66 Daytona speedster



The Daytona Speedster Is Truly a Credit to the Paige Family of Fine Cars.

also a new series of 6-44 special models designed, equipped and finished for those buyers whose good taste demands a cer-

illustrated is one of the finest developments of the season and has occasioned a great amount of attention by the public.

King's Car Now a Hack.

THE King of the Belgians' automobile, in which King Albert toured the battlefield during the war, is now doing duty as a motor hack at the railway station in Baltimore, says The Washington Star. It has a costly limousine body on a long wheelbase, and the interior, from the velvet covering on the floor to the dome in the roof, is finished in mahogany and oak inlaid. The seats are fashioned more like costly furniture than like the usual automobile seat and are covered with heavy gray whipcord material. The royal colors that once decorated these coverings have been removed.

Directly in front of the front seat is a miniature chiffonier. It is equipped with a disappearing mirror and drawers which open to the touch of hidden springs. In these are receptacles for brushes and shaving materials.

The history of the limousine from the time it left the ownership of King Albert is rather vague. It is said Douglas Fairbanks bought the machine while in Europe and brought it to this country to use in making several pictures. It was

sold several times afterward and just recently came into possession of Gilbert H. Richards of the Eutaw Motor Sales Company, Baltimore.

Richards removed the massive brass headlights and running lights, which used acetylene, and replaced them with electric lights. He also removed the twin tires on the rear wheels. These are about the only changes that have been made. Traces of the royal yellow, in which it was once painted, can still be seen where the coach worker who painted it could not get his brush.

RADIO ANNOUNCEMENT OF CONTEST IS MADE.

RADIO announcement of the national essay contest on good roads for a four years university scholarship offered through the Highway and Highway Transport Education Committee has been made by the United States Post Office Department in behalf of the thousands of boys and girls who expect to participate, and in the interest of good roads generally.

Essays, said the "voices of the air," should not exceed 700 words in length and should be handed high school principals or teachers not later than May 1 of this year. Students were urged to depend largely upon their own observation for information, and it was said contestants are placed on their honor to submit only original papers.

High School principals and teachers, who will receive the essays, will in turn submit the best three of those written in their schools to a designated educational institution, within the respective states, co-operating with the committee in the conduct of the contest. Further information, if desired, should be sought of the Highway and Highway Transport Education Committee, Willard Building, Washington, D. C., it was said. Dr. John J. Tigert, United States commissioner of education, is chairman of the committee.

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\$12 Diamond Bumpers.....\$5.50

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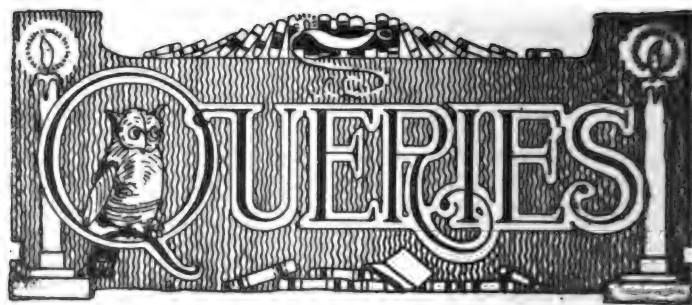
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A Tractor Journal devoted to the tractor industry and trade

Published by

The Automobile Journal Publishing Company

PAWTUCKET, RHODE ISLAND



HARDENING CAST IRON.

(C. F. B., Dover, N. H.)

I have some large cast iron rolls which I intend to use in a small rolling mill I am constructing. These rolls are of ordinary gray iron, not being chilled. Is there any method that you know of by which these rolls can be case hardened or chilled.

The following recipe will case harden cast iron not to the extent that chilling will when the iron is being poured, but, I believe, sufficiently for the purpose for which you intend to use the rolls: Pulverize and mix together equal weights of saltpeter, prussiate of potash and a half ounce of sal ammoniac. Heat the cast iron rolls till red hot, roll them in the powder and then plunge them into the cooling liquid.

WHEELS OUT OF ALIGNMENT.

(R. F. D., Yorktown, Va.)

The front wheels of my car are out of alignment about one-half an inch. I tried to remedy this defect by screwing the adjusting yoke in farther on the tie rod, but found that the yokes had been turned up to the end of the threads. It has been suggested that I bend the tie rod in order to correct the wheel alignment. This seems a very poor arrangement to use on a high priced machine. In your opinion what is the best method to employ in correcting this defect?

With all due respect to your informant, the arrangement suggested for correcting this misalignment is employed by persons of a lazy and indifferent disposition. It is a poor arrangement and a direct abuse of the metal used in the tie rod. At the best it is only a temporary repair and the bend will soon straighten out again.

Each time this "make-shift" method is used it detracts from the tensile strength of the steel, and if resorted to often the steel will eventually become crystalized and the rod will part. The tie rod of an automobile is subjected to many severe shocks and for this reason a considerable factor of safety has been applied in its design and manufacture. This factor is large enough to allow the automobilist to travel in the car without disturbing thoughts of accidents caused by defective steering mechanism, but it never should be lowered intentionally by the bending and rebending of the tie rod.

To correct this misalignment take out the bolts located at each end of the tie rod and remove the rod from the steering arms. Unscrew the adjusting yokes and wrap around the rod a piece of medium emery cloth, inserting the portion wrapped, between the vise jaws. The emery will tend to prevent the rod from turning and the cloth will prevent the vise jaws marring the softer metal of the rod. Obtain a die and stock of proper size, thread and hand, and slack away the cutters of the die in order that the fit in the yoke of the old thread will not be impaired.

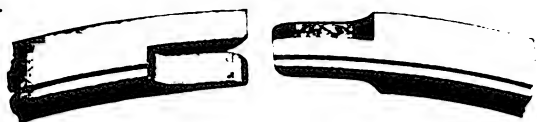
Apply a good coat of white lead and lard oil to the portion to be threaded and work the die on slowly.

Do not endeavor to bring the new thread to the proper size in one cut for if you do the chances are in favor of your making a poor job by tearing the steel. Instead of doing this it is better to make three or four cuts if necessary. This will make a job of real workmanship that will last and should the need for readjustment ever arise it will be easily and properly accomplished.

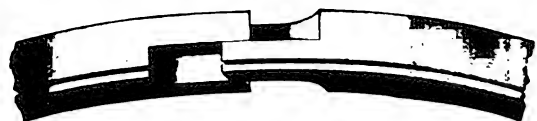
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At Last—the *Only* Better Piston Ring

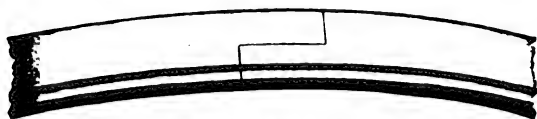
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THE EVERYDAY MASTER LOCK JOINT locks the ring EDGEWISE and WIDTHWISE—just like a solid ring. It expands to fit worn walls—but it still maintains its solid joint.



THE EVERYDAY MASTER LOCK JOINT expanded—it is still just like a solid ring! By reason of this expansion standard size rings fit many oversize requirements.



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POWER PACKING GROOVE. A deep cut, oblique angle that holds a positive film of oil. Retains power. More bearing face.

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Resold by leading dealers*

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4½" to 5" .70.

Sizes:

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ONLY Everyday Piston Rings have exclusive advantages that make them the *only* better piston rings for you. Moreover, their features make them *better* rings for your customers—*price, service, long life and satisfaction.*

The Master Lock Joint—just *one* feature of Everyday Piston Rings—gives you a host of real advantages that mean more sales and more profit.

- Everydays are locked edgewise and widthwise—they absolutely eliminate joint leakage—you can't force gas—oil—power past their overlapping and interlocking joint.
- Everydays fill every diameter requirement—in fact, *one* size Everyday will fit a range of diameters that would require three sizes of any other ring.
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- Everydays maintain a more even constant spring tension under all compressions and temperature.
- Everydays allow you with a smaller stock to take care of *more* customers than with double the number of any other kind of rings.
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AUTOMOBILE JOURNAL
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*Indicates Article Is Illustrated.

Lyon Spring Bumpers are quickly and easily attached to any car



1 Insert Hook Bolt on lower edge of car frame, about one-half inch from Snubber.



2 Apply Bracket to Hook Bolt.



3 Hold Bracket and Hook Bolt in position while Bumper Leaf is placed on Hook Bolt.



4 Place Lock Washer and Nut on Hook Bolt and tighten.



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DANGEROUS street crossing! Brakes on hard! Car skids and bumps trolley! But it's nothing serious. Car is protected by Lyon Bumpers.

It is because of the wonderful protective qualities of Lyon Spring Bumpers that they are so much in demand. For the same reason they have become one of the best paying accessories that car dealers, garages and accessory shops can handle. Turnover is fast—congested traffic and increased possibilities of collisions are making Lyon Spring Bumpers easier to sell all the time.

The powerful spring steel construction plus the Lyon-patented opened "loop-end" design enables Lyon Spring Bumpers to take blow after blow and always spring back into perfect shape. When struck, the "loop-ends" yield to the blow and absorb it completely. The chassis never feels it.

We guarantee the Lyon Spring Bumper to take the full force of any blow at 15 miles an hour without damage to bumper

or car. No other bumper is so resilient—so damage resisting!

Insurance companies make a 12½% reduction on cars protected front and rear with Lyon Spring Bumpers. This is a mighty strong selling argument for you, because the insurance reduction is enough to pay for the bumpers.

The Lyon "New Way" attachment makes it possible to attach the Lyon Spring Bumper in ten minutes, regardless of snubbers or other shock absorbers. No alterations or drilling are necessary—see the illustrations on the left. The "hook-bolt" that is used is a Lyon-patented feature.

These superiorities plus the attractive appearance of Lyon Spring Bumpers enable us to sell more Lyon Spring Bumpers than all the others put together. In fact, a year ago the demand was greater than our production. But now our daily capacity of 5,000 Lyon Spring Bumpers permits us to guarantee prompt and dependable deliveries.

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Jobbers: If your stock doesn't include Lyon Bumpers, write to us; our proposition will benefit both of us—it is fair and square.



Lyon Standard Bumper



Lyon Convex Bumper

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RESILIENT BUMPERS

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QUALITY SNAP RINGS

*Easy to Install
Quick Seating
Long Lived
Accurate*



"Cast to Last"

IF YOU were to build a fine engine, how would you select the different parts to be used?

You would do the logical thing, if the motor were to be a success. You would first investigate and find out how successful engines are built.

Your investigation would quickly take care of any piston ring problems, because the predominance of QUALITY Piston Rings would prove they are accurate—quick-seating—long-lived—easy to install—and rightly priced.

This same care of selection should be exercised by every Jobber and Dealer, to make certain the final consumer secures better values and better satisfaction.

All standard sizes and standard oversizes are carried in stock and are immediately shipped, 12 to the box, carefully wrapped in waxed paper.

Send for booklet "Cast to Last"

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MUSKEGON, MICH.

THE AUTOMOBILE JOURNAL

VOL. LXIX.

PAWTUCKET, R. I., JUNE, 1922.

NO. 10.

Murphy, Shattering DePalma's Record, Wins Classic

Stopping Only for Tires and Fuel, Victor of Indianapolis Race Averages 94.48 Miles an Hour, Leading Field for Entire Distance.

LEADING from start to finish, Jimmy Murphy of Los Angeles, Cal., winner of the 1921 French Grand Prix, carved his name deeper in the hall of motor fame when he flashed his Murphy Special across the wire a winner of the 500-mile automobile race at the Indianapolis Speedway before a record breaking crowd of 135,000 spectators.

Murphy smashed all records for the distance to smithereens, clipping more than 16 minutes off the best previous record. His time was 5:17:30:79, an average of 94.48 miles an hour, against the old record of 5:33:55:51, or 89.84 miles an hour, made by Ralph de Palma in 1915.

MURPHY did something which had never been accomplished before at the Indianapolis Speedway and, to the knowledge of racing experts, never before in a race of major importance. He shot into the lead at the start and never relinquished it during one instant of five hours of thrilling driving. He was the first away, first over the line at the completion of the first lap, and was first over the wire when Captain Eddie Rickenbacker waved the flag for his victory.

The Los Angeles driver made only three stops during the entire 500 miles. He made his first stop at 185 miles, pulling up at the pits for two minutes to change all tires and replenish the fuel tanks. With a lead of about 10 miles, Murphy pulled into the pits for another tire change and for more gasoline and oil after he had traveled 368 miles. The assistance of his pit men was nothing short of marvelous. It took them just 28 seconds to change a right front tire and provide him with

fuel enough to assure his finishing.

While major honors went to Murphy, Harry Hartz, also of Los Angeles, who finished second, drove a remarkable race in a Duesenberg. He jumped into second place 60 miles after the start and held it throughout, always making a desperate fight to catch Murphy. Hartz's time was 5:20:34:59, an average of 93.54 miles per hour, which also was far in advance of the record.

Eddie Hearne, a veteran racer, piloted a French Ballot car to third

place in 5:22:26:08, for an average of 93.04 miles an hour, while Ralph de Palma, one of the favorites, also driving a Duesenberg, was fourth in 5:31:04:65, an average of 90.61 miles an hour. Ora Haibe was fifth in 5:31:13:45, an average of 90.56 miles an hour. Jerry Wonderlich was sixth in 5:37:52:34, an average of 88.79 miles an hour. I. P. Fetterman finished seventh in 5:40:55:44, an average of 85.69 miles an hour. Tom Alley was ninth in 5:57:34:13, an average of 83.89. Joe Thomas finished 10th in 6:05:01:47, an average of 82.19.

Confusion among the judges and timers resulted in the erroneous announcement shortly before the 200th mile that Murphy had lost the lead and Hartz had gone into first place. Signals were passed to the drivers that Hartz was leading and even Murphy thought the checking was correct, as he began to force a much faster race in his fight to regain the lead. He jumped the average of 93.52 for 200 miles to 94.41

HOW THEY FINISHED IN 500-MILE AUTO RACE CLASSIC.

| Driver and Car. | Time. |
|--------------------------------|------------|
| J. Murphy, Murphy Special..... | 5:17:30:79 |
| H. Hartz, Duesenberg..... | 5:20:34:59 |
| E. Hearne, Ballot..... | 5:22:26:08 |
| R. de Palma, Duesenberg.... | 5:31:04:65 |
| O. Haibe, Duesenberg..... | 5:31:13:45 |
| J. Wonderlich, Duesenberg.. | 5:37:52:34 |
| I. P. Fetterman, Duesenberg | 5:40:55:44 |
| L. Vail, Disteel-Duesenberg | 5:50:07:42 |
| T. Alley, Monroe..... | 5:57:34:13 |
| J. Thomas, Duesenberg..... | 6:05:01:47 |

*New record. Old record, 5:33:55:51, made by Ralph de Palma in 1915. Winner's average, 94.48 miles per hour.

for 275 miles and then again to 94.54 for 300 miles.

As winner of the event Murphy will receive approximately \$35,000. Twenty thousand dollars was awarded first place and \$8000 as lap prize money. In addition, automobile accessory companies provided cash prizes, which will bring Murphy's total to the \$35,000 mark. Hartz got \$10,000 for finishing second; Hearne got \$5000; De Palma, in fourth place, \$3500; Haibe, \$3000; Wonderlich, \$2200; Fetterman, \$1800; Vail, \$1600; Alley, \$1500, and Thomas, \$1400.

Barney Oldfield, a retired star of the racing world, with the customary cigar in the corner of his mouth, paced the field for the first lap, bringing them to a flying start at a speed of about 70 miles an hour. Then Murphy stepped out in front, leading for the first lap, with Leon Duray and then Ralph de Palma.

Howard Wilcox of Indianapolis was the first driver forced out, his car breaking a valve spring after

traveling 17½ miles. Jules Ellingboe furnished the first big thrill when he threw a right rear wheel on the south turn. The speeding machine turned completely around on the track and crashed into a concrete retaining wall. Ellingboe and his mechanism remained in the car and neither was injured.

Wilbur D'Alene furnished a second thrill when his car caught fire on the back stretch. D'Alene and his mechanic jumped and escaped with a slight singeing. The fire was extinguished but the car was eliminated from the race. This was D'Alene's second narrow escape from death from fire. His previous experience was at the Chicago Speedway in 1917 when his machine caught fire and his mechanic was burned to death. D'Alene escaped with slight burns.

Tommy Milton, 1921 speed champion and winner of the 500-mile race here last year, was among the drivers forced out of the race early. A leaking gas line caused his with-

drawal. Jules Goux of France went out of the contest on the 16th mile with a broken axle. He was among the leaders when the axle gave way.

Leon Duray, claimant of the 1921 dirt track championship and driving his first speedway race, gave Murphy a terrific battle early in the contest, but was forced out at 235 miles with a broken axle. Peter de Paolo, nephew of Ralph de Palma, was in the third smash-up of the day, his car hitting the outside retaining wall, skidding more than 100 feet and landing at the bottom of the track. The driver was uninjured, but the car was unable to proceed.

The pluck of W. Douglas Hawkes of London, England, driving an English car, won the admiration of the crowd. Outclassed by many miles in speed, the machine nevertheless showed wonderful endurance. It was still running when the 10th car ended its journey and the race was officially closed. Hawkes was about 30 miles behind the last to finish.

CHEVROLET UTILITY COUPE

A NEW closed motor car built for professional men, salesmen and other business travelers is announced by the Chevrolet Motor Company to sell for \$720 f. o. b. Flint, Mich.

This "Utility Coupe" model, as it is called, has been especially designed as a sturdy, comfortable, economical and at the same time good looking car for year-round use.

It is of the two-passenger single seat type. But it has many features which make it ideally suited for its purpose.

The lines of the Fisher built body are smart yet very practical and efficient in appearance, designed to reflect credit on the owner or the house he represents. It is finished in fine black.

The passenger compartment is commodious both as to leg room and seating comfort. The seat in fact is 41 inches wide with a back 21 inches high, designed to support the whole spine. Trimming is of black and white stripe durable cloth.

Both side and rear windows are wide, giving free vision all around and plenty of openness in warm weather. Side windows have Ternstedt regulators for greatest ease in raising and lowering.

The windshield is adjustable both top and bottom and is equipped with a black metal visor with rain gutter.

The doors have been made exceptionally wide, allowing a 28-inch opening for the easy entrance and exit of men who are in and out of their cars a great deal. They are provided also with double

latches and anti-rattlers for quietness and stability, can be locked and are faced inside with high grade imitation leather to resist wear.

An outstanding feature of this new Chevrolet model is the unusually large compartment in the rear of the body, having a capacity of nearly 15 cubic feet. While the size of this compartment is cleverly concealed by the flowing body

quiet, easily adjustable Chevrolet valve tappets; selective type transmission, three speeds forward and one reverse, hand lever control; independent clutch and service brake pedals; foot throttle, etc.

The strong, quiet spiral bevel ring gear and pinion are part of the rear axle construction.

Equipment is complete, including elec-

Salesmen Have Found This Utility Coupe Especially Well Adapted to Their Needs.



lines, it is large enough to accommodate a steamer trunk, and still have ample space for samples, advertising matter, instruments, etc.

In addition to these exclusive features the Utility Coupe shares all of the chassis refinements and improvements of other Chevrolet models.

It has the same powerful yet economical valve-in-head motor with the new

tric starter and head lamps with legal lenses, speedometer, ammeter and oil gauge on dash, demountable rims with extra rim, tire carrier and license holder. Non-skid cord tires front and rear are standard.

This is the first passenger automobile that has been designed and put on the market particularly for commercial and professional use by Chevrolet.

The Car Theft Problem

A Compilation of Authentic Facts and Figures Detailing Operations of Automobile Thieves and Suggesting Methods for Minimizing Losses Consequent on Their Activities

WHO makes the most money—the bootlegger or the automobile thief? Figures are lacking for a complete comparison of the income from these two highly profitable businesses, but the man who knows more or less about existing conditions would be willing to gamble that the motor car thieves gross a great many more dollars than do the peddlers of illicit joy juice. There is very conclusive evidence to prove that car stealing is organized, operated, financed and conducted in exactly the same manner

as any legitimate business, with the exception that where the average industrial venture may figure on a paltry net profit of 10 per cent. the car pirate's net profits are very nearly on a par with the amount of money he takes in. But "somebody is always taking the joy out of life," and it seems that this comparatively new apothegm is to prove true in the case of the car thief, since already there is a bill before the Federal lawmakers that will make it a whole lot harder to steal automobiles than it will to sell bootleg whiskey.

THIS proposed protection against the most active criminal we have with us today calls for Federal registration of all cars at a fee of \$2, and one phase of the plan calls for the stamping of a registration number on the engine of the car in such a way that it cannot be altered, repeating the number on a conspicuous part of the car body. This idea, presumably borrowed from the method of branding cattle, should work out in a very satisfactory manner. In the old frontier days there was little chance for a man to become particularly affluent through the raising of cattle, because about the time he got to the place where he could claim a couple of thousand head of cattle, along came a band of rustlers and ran them off. Once they had mingled with another herd there was absolutely no chance for their owner to identify them. Eventually, however, came one who suggested branding the cattle with the owner's private mark by means of a hot iron—and right there the activities of the cattle thief were curbed.

Of course it was possible for him to establish a brand and then alter the brand of stolen cattle to conform to his own, but, relatively speaking, the brand reduced cattle rustling to the life of any other mighty dangerous and ill paid occupation—and the same will prove true of the stealing of automobiles once the Federal "brand" idea has been satisfactorily worked out.

A short time ago Federal aid to the state police authorities was afforded when the statute, which made it a misdemeanor under heavy penalties to transport a stolen car from one state to another, was put into effect. That enactment, good though it admittedly was, didn't have the "teeth" that the new one will have, and it is hoped that no opposition will develop to withhold the enactment of this law, because the business of car stealing has grown to proportions that are appalling.

New York City alone—and we'll admit that it's a large place—had more than 9000 automobiles stolen last year, to say nothing of those that were robbed

HERE'S A CURE FOR CAR THIEVERY



Once He Has Listened to the Arguments of This Thousand-Shots-a-Minute Gun, the Most Hardened Thief Will Steal No More Cars. (Wide World Photo.)

of a tire, carburetor, motormeter or some other part of their equipment. At the rate the reports are coming in this year, the record for the country will be much higher than in 1921, according to the various insurance company officials who state that the loss last year, way up in the millions, promises to be higher for 1922—this, of course, not taking into account the many cars stolen that were not carrying insurance, and referring only to the losses incurred by the insurance people.

It is entirely within the bounds of reason to assume that many of the cars "stolen" are disposed of in order that certain unscrupulous persons may obtain their insurance money. This may be accounted for by the fact that cars insured during the time when prices were high were worth more to the owner as stolen

cars than they were in their used state.

In other words, if a car costing \$2000 in 1920 was insured for close to that sum and "stolen" at the time when new cars of the same make were to be had for around \$1500 following the price drop of last year, it is quite obvious that the owner of that particular car might obtain money with which to purchase a new model of the same make and have a few dollars left for gasoline; provided the owner could collect.

In this connection, it might seem wholly within the bounds of reason to predict that cars insured during the last few months will show a certain immunity to being stolen that will be apparent when the figures for the latter part of 1922 are compared with those of a corresponding period during 1921. Al-

though the first few months of the year have shown a decided gain.

Fords Head List of Stolen Cars.

The Ford car is the one oftenest stolen. In New York City during 1921, there were very nearly 1700 cars of this make made away with by thieves. Even Henry Ford himself, if reports are to be credited, is not immune from the visits of the car thief and had his own Ford car stolen in Detroit a week or two ago.

The car of this type is much easier to steal than any other, for the simple reason that a majority of all the cars in the United States are Fords, and it has been rightly said that the average Ford owner could not identify his own car from a number of others, once it had been lost for a week.

Also, it is much easier to dispose of a Ford than any other car. Instances proving this have been numerous. We recall a case where a Ford car owned in a small eastern city was stolen while the owner was attending a theatre in Boston, was resold to a new owner who lived in the same town with the former owner, and was in daily use by the new owner for close to a year when an upholsterer in working on the back of the rear seat of the machine uncovered a visiting card that the former owner had placed there when he first bought the car in order to identify it if it ever was stolen. (Incidentally, this method of identification is somewhat similar to that used by the country youth who painted his wheel hubs red—neither has much to recommend it.)

The Ford owner, for some reason not clearly defined, is not always as careful as he might be in locking his car when leaving it. There are various devices on the market for safeguarding the car of this type, many of which are very efficient, but, for some reason or other, the owner does not seem to be inclined to make use of them to the extent that one might expect him.

The Buick and the Dodge both seem to have a strong fascination for the automobile thief and hold second and third place respectively among the many different makes of cars stolen.

Bootlegger Steals Fast Cars.

Since the advent of the bootlegger, there have been more of the fast cars stolen than ever before. Stutz, Mercer, National, Peerless, Cadillac cars and other makes that possess untold speed and hold the road under adverse conditions seem to meet with the rum runners' approval, and, since cars used for transporting liquor are confiscated if the driver is caught, one might as well use the best and get it in the easiest way—or, at least, that seems to be the way in which the bootlegger reasons. Certainly it isn't doing the bootlegger an injustice to intimate that he would be guilty of breaking one law any quicker than he would another.

High Priced Cars Immune.

The very high priced cars are not often stolen. For instance, there was only one Rolls-Royce stolen in a large western city last year, and only four reported in New York—out of the several thousands of cars of all makes made 'way with. There were few Stevens-Duryeas

FOREST HIGHWAYS TO SPEND TWO MILLION IMMEDIATELY

EXPENDITURES totaling \$2,038,697 of National Highway Funds for the construction of 57 miles of highway in Utah, 90 miles in Wyoming, 50 miles in Washington and 50 in California have just been approved by Secretary of Agriculture Wallace. This money was made available for roads serving the national forests and for roads within or adjacent to the forests, which are of primary importance to the states, countries, and communities.

stolen. The same is true with the other high priced cars of which there are several makes with which the reader is more or less familiar. There are three good reasons to account for this. The first is because these cars usually are chauffeur driven. That lessens the chances of loss by theft. The second reason is that there are comparatively few manufactured. The third and most obvious is that the thief who steals one of these machines will have his work cut out for him if he is to find a customer for it. There'd be something phony sounding in the offer of a stranger to sell one a fairly new Stevens-Duryea landaulet for \$1200, or a Cunningham or a Pierce Arrow, or a Leach or a MacFarland. One would be quite apt to refer him to the chief of police as a possible customer and he'd be just as likely to drive swiftly away without taking the advice.

Insurance a Precarious Business.

The insurance people, simply because of the fact that there are more than 10,000,000 motor vehicles in the country, probably make a fair enough profit from insuring cars, but the fact remains that the business has all the appearances of a precarious occupation when one looks at the theft figures. If a car is stolen the insurance company loses. That's final. Whether it is recovered or not doesn't matter, because, if it is, there is a reward they must pay and if it isn't they have to settle with the owner.

A. R. Small, vice-president of the Underwriters' Laboratories, Inc., of Chicago, and a recognized authority in the insurance world, said at a recent address before the Society of Automotive Engineers that there was one certain way of eliminating insurance losses caused by the theft of automobiles and that way was for the companies to refuse to write this form of insurance. He then went on to say that because it is the ambition of the modern insurance company

to offer 100 per cent service or protection, this insurance must be continued and ways found by which to restrict losses at a non-prohibitive cost to the insured. "In the early days of the automobile," said Mr. Small, "the theft problem did not exist. Automobile-theft insurance, when, and if written, was included by the agent and his company for but a nominal increase over the premium charged for fire insurance, merely to make the coverage complete. Persons who could drive cars were few. The appearance of a new or strange car in the community was a matter of neighborly comment; its history was known or readily ascertained. Without a closer analysis of the development, volume production and general utility became features in the definition of the automobile-theft problem. Statistics show at least 9,000,000 automobiles of the private passenger-car type licensed for use in the continental United States. It is probably a conservative estimate that there are three persons to every car now in use, or from 20,000,000 to 25,000,000 persons who are provided with the knowledge for automobile operation.

Losses Date Back to 1913.

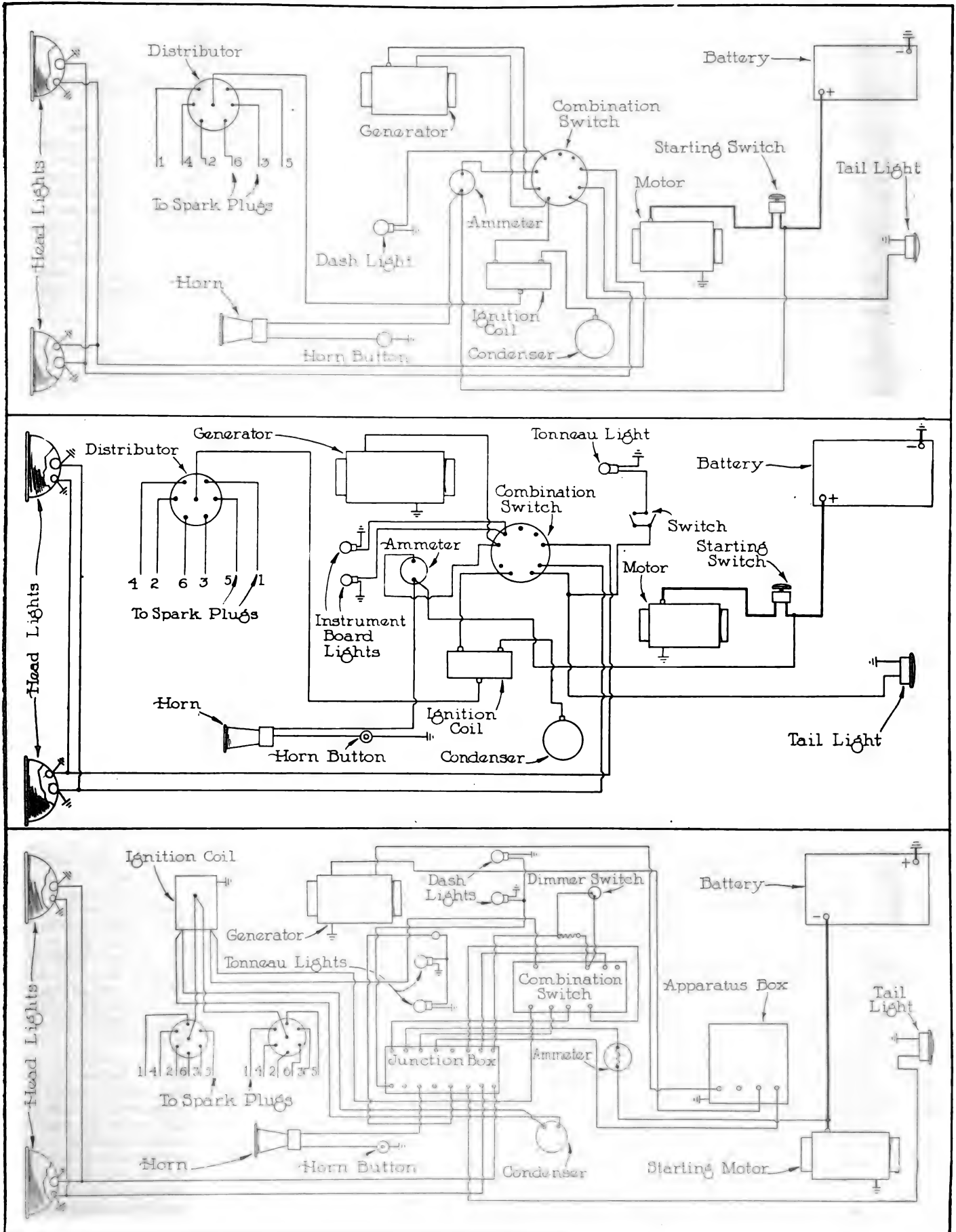
"Insurance losses from the theft of automobiles first reached serious amounts, perhaps, in 1913 and certainly by 1915. Most of the losses of that period did not involve theft for illegal sale and money gain, but were from damage to the car resulting from unauthorized joy-riding. The general impression among automobile underwriters is that this cause of loss is not now a predominating factor of the total loss. Shortly after this, the losses from drive-away disappearances caused disturbance, but this source of loss has largely vanished because of the comparative readiness with which railroads now furnish box cars for shipment. Whenever organized theft of automobiles upon a commercial scale had its beginning, its successful growth had become plainly manifest in 1917. From 1918 to 1920 inclusive, in part, because of the universal list-price increases, when the used car value became enhanced nearly 100 per cent of its original value as a new job and when decreased production, due to war conditions, delayed deliveries of new cars, the theft loss-ratio was shockingly large.

Moral Hazard is Factor.

"The so-called moral hazard is a factor in every general risk for which insurance is written. Its share of the gross loss ratio is not capable of analysis further than to observe that it varies with the economic situation of the people as a whole and with the public sensibility of general right and wrong. Normalcy, toward which all are working, should place this element in the background. There are those who assert that the use of stolen automobiles in holdups, bank robberies, liquor running and smuggling is merely a phase of this moral hazard reflecting the extent to which the present moral sense of the general public is abnormal, but it is sufficient to record that such uses have made a new market for the stolen car and added, perhaps, to the list of active thieves.

(Continued on Page 17.)

Monthly Wiring Diagram, No. 28



Top—Jordan Six-Cylinder, Model MX1922, Double Bulb, Single Wire, Two-Unit System, Negative Terminal Grounded to Car Frame. Center—Bay State Six-Cylinder, Model 1, 1922, Continental Motor, Double Bulb, Single Wire, Two-Unit System, Delco Ignition. Bottom—Pierce-Arrow, Model 33, Six-Cylinder, Double Bulb, Single Wire, Two-Unit System, Double Ignition, Circuit Breaker in Apparatus Box, Motor Brushes Lowered for Cranking.

LEGAL POINTS

By SAMUEL WANT

MOST policies providing for accidents due to "collision" contain a specific provision that they shall not cover damages caused "by striking any part of the roadbed." It has been decided that the curbing of a street is a part of the roadbed within such an exception, and hence that damage caused by colliding therewith is not covered by the policy. On the other hand, the guttering along a highway is not within the exception in question.

IN A recent case an automobile standing in a garage was damaged by the second floor of the garage falling on it. It was decided that this accident did not come within a policy protecting the owner against damages arising from "collision."

A RECENT decision of the Court of Appeals of the District of Columbia points a warning about the protection of insurance where a lien is given on a car. Most policies provide that the insurer must be notified if a lien is placed upon the car, and that the policy shall be absolutely void if this notice is not given. In the case in question this provision of a policy was enforced, so that the owner of a car sustained a total loss on a claim that otherwise came squarely within the terms of his policy.

IN A recent Ohio case the evidence showed that a wholesale house kept an automobile for the use of its salesmen. The car was used on the occasion in question by the bookkeeper and cashier, and through their negligence a pedestrian was injured. There was no evidence to show that the parties referred to had any right to use the car, or that they were using it in the prosecution of their employer's business at the time of the accident. The court held that the owner of the car was not responsible for the accident.

THE new edition of Huddy on Automobiles, recently published, collates the latest decisions construing automobile insurance policies covering "collision." It is found that these policies are held to cover collisions with either a moving or a stationary body. In fact, the expression, "collision with," as used in a policy, may be deemed equivalent to "striking against." And the stationary body with which the car finally comes in contact may be either land or water. Thus a loss resulting where a car was precipitated over a bridge into the water below, and was damaged solely by the immersion, was decided to be covered by a policy covering "collision." But in a case where the injury was caused by turning in a ditch at the side of the road

when passing another vehicle, causing one of the wheels to collapse, it was decided that the loss was not covered by the policy.

QUIETLY and unremittingly the courts are doing effective work toward the suppression of the growing evil of automobile stealing. Recognizing that the underlying factor in the situation is the facility with which stolen cars may be marketed, the courts are laying down the law relative to the receipt of stolen property with a severity and particularity that leaves little room for escape upon the part of even the most astute receivers.

In a recent prosecution in Kansas against the purchaser of a stolen car, upon the ground that he purchased it with knowledge or suspicion of its felonious acquisition by the seller, the principal evidence relied upon by the prosecution was the simple fact that the engine number on the car appeared to have been altered. The defendant contended that he did not attach any importance to this when he bought the car, and that he had no knowledge that would indicate fraud or crime on the part of the seller. The court held, however, that the mere fact of the alteration of the engine number was sufficient to put a reasonably prudent man upon inquiry, and to arouse his suspicions and, that where such a condition is proved and is not explained away, a jury may infer that the purchaser of the car had knowledge pointing to its theft by the seller. This ruling was sustained, on appeal, by the Supreme Court of Kansas.

ACCORDING to a recent decision of the supreme court of Kentucky, the father is liable for injuries inflicted through the negligence of his son in driving the car of the former, where the former permits his son to use the car. In the case in question, the son was out for a joy ride with his friends when the accident occurred, and the father sought to escape liability because the car was not being used in his business or for his benefit at the time.

ANOTHER important decision on the same subject has been rendered by the supreme court of Illinois.

The legislature of the State named passed a law making it a criminal offense for any person to purchase or have possession of a car on which the manufacturer's number or identification mark had been removed, defaced, covered, or destroyed. In a prosecution brought under this statute, the accused argued that the statute did not apply to him because when he purchased the car in question he did not know or notice that the maker's

number had been tampered with. The court decided, however, that a conviction under the statute was sustainable without regard to the accused's state of knowledge, the purpose of the law being twofold: (1) To require all purchasers of automobiles to take the indicated precaution before consummating their purchases, and (2) to make it impossible for a thief to hide his crime and market his booty by the elimination of the tell-tale identification marks.

AN UNUSUAL accident occurred in Kentucky recently. Two cars collided at a street intersection. One of the cars was thereby deflected from its course and struck the traffic policeman, who was on duty at the point in question. The court found that the accident was due to the joint negligence of both of the drivers and awarded judgment to the injured policeman against the owners of both cars.

A RECENT Iowa case is to be added to the many decisions referred to in this series on the subject of the special precautions required of motorists to avoid injuring children, notwithstanding negligent and imprudent conduct on the part of the latter.

In the case in question a boy was riding his bicycle on the wrong side of the street and when he unexpectedly got in close proximity to an automobile coming from the opposite direction he became confused, causing a collision in which he was seriously injured. The evidence showed that the car was not being driven at an excessive rate of speed, or otherwise in violation of law, but it also appeared that the driver took it for granted that the boy would have sense enough to get out of the way, and that therefore he did not slacken his speed as he approached the boy. The court held that under all circumstances, having regard especially to the known indiscretion and lack of judgment on the part of the children, the driver of the car should have reduced his speed when he got in close proximity to the boy, and that such a precaution would have avoided the accident; for that reason the motorist was held liable for the boy's injuries.

IN A RECENT case decided in Kentucky it appeared that the guest of a motorist was injured through the collapse of the rear seat of the machine. The owner had no knowledge of any infirmity in the condition of the seat, and, obviously, the defect was of a kind which could have been discovered by the manufacturer of the car before delivery if a proper inspection had been made. The manufacturer was held responsible for the injuries.

THE liability of a motorist who violates the law and, in consequence, injures another is not limited to the bare amount of damages necessary to compensate the injured person. According to a decision just handed down by the Supreme Court of Kentucky, a verdict allowing \$4,000 damages as punitive damages, as well as compensatory damages is sustainable where the motorist was under the influence of liquor at the time of the accident and drove his car in reckless disregard of traffic regulations and the safety of pedestrians, causing injuries of a peculiarly painful as well as permanent nature.

BUT in another case, decided in Iowa, where it was also proved that the motorist was under the influence of liquor at the time of the accident, no damages were awarded to the injured pedestrian, because the evidence showed that the latter stepped from the sidewalk without looking for approaching vehicles, and that he immediately came into collision with the automobile. The basis of this decision is familiar legal rule that a violation of law on part of a motorist does not render him liable for an accident, unless there is a direct connection between the violation of law and the accident—in other words—the accident must have been due to the violation, and not merely have followed or accompanied it.

IN VIEW of the continual increase in the number of machines built on the assembly plan, interest is lent in the recent decisions covering the rules of liability of manufacturers of and dealers in cars for injuries resulting from defective parts not manufactured by the so-called manufacturer of the car.

There seems to be a uniform current of authority in all the States to the effect that the dealer is not responsible for the consequences of defects in parts of which he had no actual knowledge, provided the defects were not so patent upon casual inspection that he could not have failed to notice them when examining the car in the usual course of his business. This freedom from liability, however, is the rule only where there is no express agreement on the subject between the dealer and the purchaser of a car. For example: In a recent decision in California, the dealer gave the purchaser a warranty that the car was "free of defects in material and workmanship". The car did not work satisfactorily, and, when the owner demanded the rescission of his transaction, the dealer refused to give him any satisfaction, claiming that the defects in the car related to its design and construction—the matters of which he said could be complained of only to the manufacturer. But the court decided that the general scope of the dealer's warranty did not admit of such a limitation and that he was compelled to take the machine back and return the purchase money paid.

THE COURTS are likewise agreed that the manufacturer of an automobile, whether sold directly to purchaser or sold through a dealer, is lia-

ble for the consequences of defects in parts which he knew were defective, or which he could have learned were defective had he used reasonable tests before making delivery of the machine. This is true both where the defective part is the product of the manufacturer of the car and also where it is an assembled part. There is a decision of a United States court, however, to the effect that a manufacturer of a car which was sold through a dealer was not liable to the purchaser for an injury sustained as a result of the collapse of a wheel, this unit being one of the assembled parts of the car, although the evidence showed that the defect in the wheel would have been discovered before the delivery of the car if the usual tests had been made. The exemption from liability was sustained upon evidence showing that the manufacturer of the car bought the wheel from a responsible source, upon representations which led him to believe that it was a reliable product.

IN A case in which it was shown that the accident was due to defective spokes in one of the wheels which the manufacturer of the car bought from a reliable maker, the former was held not to be responsible. The evidence showed that the usual tests had been made before the delivery of the car, and that the defects had been obscured by the veneered effect of the coloring materials.

A RECENT Ohio case points a warning for dealers in connection with the sale of cars to persons who have not attained their legal majority. In most States the age of majority for males is twenty-one years. As to females the laws of the different States vary; some fix the age at eighteen, others at twenty-one and a few at twenty-five.

In the case in question a young man under the legal age, but possessed of a considerable personal estate, purchased a pleasure car. He used and abused the machine over a period of some months. Then he offered the machine back to the dealer and demanded the return of the purchase money. The dealer recognized that he was on the defensive and was prepared to take the car back, but he insisted that in making the restitution of the purchase money he should be permitted to deduct the cost of putting the car in proper condition, and the value of the use of it by purchaser. This gave rise to the litigation.

The court decided that the right of a person under age to disaffirm his purchases and secure the return of the purchase money paid by him is not limited by any requirement that he make good any loss that may thus be imposed on the dealer. As the rule of law in question is intended to protect persons of immature years against the imprudent dissipation of their estates, and is supposed to be generally known, the very purpose of the law would be defeated—so the court ruled—and if the purchaser could be compelled to make good the damages resulting from his purchase and subsequent disaffirmance.

The rule of law in question really goes much further than indicated in this de-

cision. If the purchaser of the car—a person under the legal age—had lost the car through fire or theft, or as the result of some accident, he could still have disaffirmed his purchase under the law in force in most states, and could have demanded a refund of the purchase money which he had paid.

ANSWERS TO QUESTIONS.

Q. Would you please publish your advice on the following case. About May 5th a party who was working on the road here brought in his truck for repairs. I found it necessary to have the cylinder block welded and reground, as it was scored very badly. This regrounding necessitated fitting new pistons, along with several parts needed, to put it in first class condition as same were burned out. The amount of the bill was \$180 for parts and \$100 for labor.

I finished repairs on May 18th and when the party came for the truck I would not let him take it away as he had no money to pay the bill. I afterwards found that this party had purchased the truck from Mr. B for \$3000 and had turned in another truck for an allowance of \$1200, which is all that he has paid on it. Mr. B took a mortgage on the truck when he sold it for the balance and had it recorded where he lives, as well as in the place where the party whom I was dealing with lived.

They took court action and have repossessed the truck. They sent a man to get the truck from me and I would not let him have it until my bill was paid. They contend they do not have to pay the bill and also contend they can take it out of my possession. Where do I stand in this matter? The party who brought the truck in to me has nothing, so there is no chance to collect from him. Have I a right to take out parts which I paid for and put in the truck? It seems that as I have the truck in my possession I can hold it until the bill is paid.—G. B. H.

A. Your question concerns which takes priority as a lien claim on the truck, a prior recorded chattel mortgage or your own lien for repairing same? And the answer is that the chattel mortgage becoming a lien before your own, has the first rights. Now, if the truck should be sold for an amount greater than the mortgage charge, you would share in the amount left after the mortgage was satisfied.

Some few states have laws that give a repairman priority in his repair lien over a prior mortgage, on the theory that the mortgage holder, by permitting the mortgagor to retain possession, impliedly gives him authority as his agent to order repairs and other necessary things. Such laws would be a boon to garagemen, besides being eminently just, but unfortunately few states have been able to work out or arrive at such a law.

If you have the truck in your possession and you can remove the parts without injury to it, I see no reason why you may not remove them.

I would first suggest that you use all the powers at your command to effect a more satisfactory adjustment, so you will realize on your labor.

State Regulation of Motor Vehicle

(By HARRY MEIXELL, Secretary Motor Vehicle Conference Committee.)

MOTOR vehicles are subjected to two general but distinct uses: First, they are privately employed by their owners for the transportation of persons or property; second for the transportation for hire of persons or property of others than their owners.

The second general use is sub-divided into two definite and particular uses. In the first place, motor

vehicles operating for hire are employed to carry certain persons or the property of certain persons to places prescribed in individual agreements entered into for the purpose; in the second place they are employed to carry indiscriminately all persons or the property of all persons under general conditions of agreement applicable to the whole public.

IN A word, the second general use of motor vehicles, i. e., for hire, splits into that of private carriers and common carriers.

Until a few years ago the legislatures of our 48 states in no way differentiated between these various uses of the motor vehicle in the laws which they enacted dealing with operating requirements, registration fees and the many other subjects which are usually found in a state's motor vehicle laws.

In 1914, however, Pennsylvania definitely segregated motor vehicles when used as common carriers and placed them under the regulation of the State's Public Service Commission. Today the laws of 22 states provide for a greater or less degree of such state control.

On the following pages is a tabulation setting forth a digest of the more important matters which through the year 1921 had been made the subject of those state laws specifically enacted to bring motor vehicle common carriers under state control and regulation. This tabulation should be carefully considered in connection with the following discussion of the data which it contains.

State Agency Exercising Control.

Without exception state regulation of motor vehicle common carriers has been vested by law in pre-existing state agencies that exercise control over other forms of common carriers such as railroads, trolleys, telephone and telegraph lines, pipe lines, etc. The third column of tabulation on page 4 shows that these agencies have consisted of State Public Utilities or Public Service Commissions, Railroad Commissions, the Commerce Commission as in the case of Illinois, the State Tax Commission of Alabama, the Arizona Corporation Commission or even the State Road Commission as in West Virginia.

In some instances these pre-existing state agencies have assumed control over motor vehicle common carriers by virtue of the broad general powers of the laws establishing the Commissions. The Railroad Commission of Georgia, for instance, maintains "that operators of motor vehicles, holding themselves out as carriers of passengers or freight, either or both, for hire, and operating over established routes, are subject to the jurisdiction of this Commission. This Commission has not, however, had occasion up to this time to exercise this jurisdiction." In certain other instances, however, where the laws have been specific-

ally limited in their application where their application to motor vehicle common carriers has been a matter of doubt, attempts on the part of the state agencies to extend their power over highway transportation have usually ended in the courts and in decisions adverse to the contemplated expansion of control.

Application of Control.

In its broadest conception a motor vehicle common carrier is one that passes any and everywhere over the highways indiscriminately, transporting for a consideration all person who present themselves as passengers or carrying all commodities or classes of commodities offered. Obviously this involves interstate transportation. The Federal Interstate Commerce act takes no specific cognizance of the matter, however, so the application of control by the various states is in no way guided or modified by Federal laws on the subject.

A few states deal with the subject merely from the standpoint of local control, the incorporated municipalities being given power by the state legislature to require motor vehicle common carriers to obtain permission and a license for operating from the local governing body. This is the case in Massachusetts where the Board of Selectmen or City Council exercise control over motor vehicle common carriers transporting passengers.

As for state control this expresses itself in two ways: On the one hand there is a state law whose provisions give to some state agency broad general powers of control over motor vehicle common carriers. On the other hand, for the execution of these powers, the agency is permitted to promulgate and enforce such rules and regulations as it may deem necessary, express stipulation being made in some of the state laws on the subject, that these rules and regulations shall take precedence over municipal ordinances.

The various laws establishing and defining this state control have in many cases, however, greatly narrowed its application. For instance, while most of the states which have dealt with the subject allow their respective state agencies to regulate both passenger and property transportation by motor vehicle common carriers, Alabama, Connecticut, Maine, New Hampshire and others limit this power to passenger transportation only.

Then again, while most of the regulat-

ing states apply their powers of control to carriers operating within, into and out from the limits of incorporated municipalities, California, Ohio and Oregon merely exercise authority over such transportation that is not confined solely to the limits of a city, town or other similar form of incorporated municipality.

As another and final illustration most state laws regulating motor vehicle common carriers narrow the scope of such control to vehicles operating "between fixed termini or over a regular route." In the Arizona law this expression is defined to mean the termini between which or the route over which a carrier usually or ordinarily operates his motor vehicle "even though there may be departures from said termini or route, whether such departures be periodic or irregular." As a rule it is made a question of fact for the fact state agency exercising control to determine if the carrier is operating "between fixed termini or over a regular route."

Powers of State Agency.

With very few exceptions the powers wielded by the Public Service Commissions or similar forms of state agencies over common carrier transportation by motor vehicles are extremely numerous and broad. A consultation of the chart shows that these powers can be listed as follows:

- (1) Grant, refuse to grant, amend or revoke certificates of public convenience and necessity.
- (2) Prescribe routes.
- (3) Fix schedules.
- (4) Determine character of service and promote the comfort and safety of traveling public.
- (5) Establish fares and rates.
- (6) Require reports and uniform methods of accounting.
- (7) Examine accounts and records.
- (8) Supervise fiscal affairs such as incorporation, capitalization of stock, etc.
- (9) Compel additions to, extensions of or betterments in physical equipment.

It is apparent that these powers are practically unlimited and of such a nature that the state agency has almost absolute control over the life or death of motor transportation within its jurisdiction. Nevertheless all of the rulings of the various commissions are subject to review by the proper courts and aggrieved parties can easily and

freely appeal for redress of wrongs or supposed wrongs.

Furthermore, in the all important matter of certificates of public convenience and necessity decisions are usually made contingent on public hearings at which applicants for such certificates, other agencies of transportation serving the same territory and the general public are given full opportunity to present facts and opinions on the subject.

Up to this point in the discussion the entire subject has been approached from the standpoint of the state's power. It is now desirable to look at the question from the side of the operator of a motor vehicle common carrier, especially to learn what steps he must take in order, either to stay in business after a state adopts the policy of regulation or enter the business anew.

In a few states, as New Hampshire, for instance, it is only necessary for the operator to obtain a permit from the state authority. This is the rare exception, however, rather than the rule. In nearly every other state a certificate of public convenience and necessity is required; while in Colorado, New York and Wisconsin a permit from the governing bodies of the municipalities in which the common carrier seeks to operate must also be secured.

In several states motor vehicle common carriers established at the time the law first went into effect have been expressly exempted from this requirement making it necessary for none but operators beginning business after the passage of the law to obtain certificates of public convenience and necessity. In Connecticut, however, and in general in every other state, established, as well as new motor vehicle common carriers, have been obliged to demonstrate to the state agency their right to exist after the state control act has been written into the statute books. Obviously, this has very often meant real hardship to those who have invested substantial sums of money in motor vehicles and have built up paying businesses over certain routes only to be obliged to abandon everything.

While in the imposition of annual registration fees and other forms of taxes upon motor vehicles, state legislatures have in only a few cases discriminated between motor vehicle common carriers and private carriers, nevertheless, they have drawn a sharp line between motor vehicles used privately by their owners and those operated for hire.

By way of illustration, in Maine a motor vehicle used for hire must pay twice the normal annual registration fee for the class of vehicles to which it belongs. No extra or special charge, however, is made when this vehicle is engaged in the common rather than the private carrier business.

It will be noted from the seventh column of the tabulation that in practically every case where there is state regulation this course pursued and special and greater fees in lieu of the regular annual registration fees are im-

posed or else extra burdens are added to those usually imposed by the state on motor transportation.

In connection with the foregoing discussion it is of interest to note that the laws of Colorado expressly authorize the municipalities of the state to acquire, own and operate motor vehicle common carriers, while in Connecticut the street railway lines are given this same power with respect to passenger-carrying motor vehicles.

Another point worth noting is that while some states have not gone so far as to place motor vehicle common carriers under the full regulation of a state agency of government, nevertheless, they have enacted laws with a measure of such control in view. To illustrate: In Louisiana a statute approved in 1918 defines a power driven vehicle carrying passengers or freight for hire over the highways outside of incorporated municipalities as a "Service Car." Operators of service cars are obliged to procure from the police juries of the parishes in which they reside, certificates of their ability and skill to operate and furnish indemnity bonds against claims arising from injury to persons or damage to property.

A variation from the type of local control exemplified by Massachusetts is that which obtains in Delaware, where the Wilmington Board of Public Utility Commissioners has, with regard to motor vehicle common carriers transporting persons, prerogatives and exercises functions similar to those set forth in this report for the general form of state control.

As has already been observed, the power of the state agency exercising control is usually laid down in the law in general language which is generally so broad and comprehensive that it covers every possible phase of the motor vehicle common carrier business. This control then finds concrete expression in rules and regulations promulgated by the state agency from time to time as occasion warrants. For instance in Nebraska the Nebraska State Railway Commission entered an order on May 21, 1919, that beginning July 1 of the same year, the motor vehicles holding themselves out to carry freight for hire in a certain portion of the state should establish, maintain and apply a prescribed schedule of rates on freight to be classified in accordance with so-called General Order No. 24. In no other portion of the state nor in any other particular did the commission assert its prerogatives. Furthermore, on April 20, 1921, it rescinded and annulled this order.

As an illustration of an entirely different tendency, in Washington state, where the law placing motor vehicle common carriers under control of the Department of Public Works went into effect last year, General Order M. V. No. 1, issued June 9, 1921, provides a very elaborate set of "rules and regulations governing the transportation of persons and property for compensation over any public highway." These cover the procedure for obtaining a certificate of public convenience and necessity for a certain number of prescribed vehicles; what must be done for permission to operate more ve-

hicles in case of emergency; the sale, transfer or mortgaging of certificates; passenger and freight tariffs; rates; free passes; schedules, including changes in or discontinuance thereof; liability and property damage insurance; obligatory equipment including necessity to carry extra tires, speedometers, heating system for passenger carrying vehicles, fire extinguishers, route signs, etc.; operating regulations including in addition to the requirements of the state motor vehicle law, provisions as to the character and conduct of drivers, taking on of passengers and seating thereof, baggage, comfort stations, etc.; fees additional to the state registration fees; annual reports, etc.

Any discussion of state regulation of the motor vehicle when used as a common carrier would be incomplete without reference to the arguments for and against such regulation. In so doing, however, the opinion frequently expressed that railroad and trolley companies, as a result of the severe competition of motor transportation, are seeking state regulation as a means of killing off such competition, will be totally disregarded, and only such arguments recorded as are predicated on public welfare, sound economics and strict impartiality.

Arguments Pro.

With these premises therefore those who contend for state regulation say that such control is necessary:

(1) Because motor transportation for hire is a public utility and as such should be regulated along with other public vehicles so that travelers and shippers by such means can be made sure of safe, prompt, regular, adequate, efficient and economical service.

(2) So that, in all cases where motor vehicle common carriers come, or are likely to come, in ruinous competition with other common carriers, the state can step in and determine whether public convenience and necessity require such competition, and save, if desirable, the pre-existing agencies of transportation.

(3) In order to shoulder upon the motor vehicle common carrier obligations, financial and otherwise, in return for the rights given it to operate for a profit over all or certain highways within a state especially so since the highways are built and maintained by the public. In some cases these rights take the form of valuable franchises which virtually grant monopolistic privileges over certain routes.

(4) For the purpose of eliminating the irresponsible, so-called "fly-by-night" companies and individuals who, while undergoing certain destruction for themselves, pull down with the ruin well managed motor transportation agencies which render a real public service and are entitled to a reasonable return on their investments and a stabilization of their business.

Arguments Con.

In objection to these arguments for state regulation of the motor vehicle common carrier, opponents of the proposition maintain:

Summary of Salient Features of State Laws Regulating Motor Vehicles

| State | Law Imple- ment- | State Agency Exercising Control | Application of Control | Prerequisites of Operation | General Powers of State Agency, Etc. | Special or Extra State Taxes |
|---------------|------------------------|---------------------------------------|--|--|---|---|
| Alabama | 1919 | State Tax Commission | Passenger transportation only. Within, out from and into municipalities. | Filing of written statement showing terminal points of routes to be covered. Obtain- ing of special license. | x | In lieu of regular registration fees, the following seating capacity a pass. of .....\$37.50 seating capacity over 5 pass., less 60.00 than 10 80.00 seating capacity over 10 pass. x |
| Arizona | 1919 | Corporation Commission | Passenger and property transportation. Within, out from and into municipalities. | Certificate of Public Conven- ience and Necessity. Indem- nity bond as conditioned by Commission. | General control over granting of Certifi- cate of Public Convenience and Necessity; regulating service; fixing rates and fares. | x |
| California | 1917 | Railroad Commission | Passenger and property transportation. Out from and into municipalities only. | Certificate of Public Conven- ience and Necessity. | Grant, refuse, suspend, revoke or amend Certificates of Public Convenience and Necessity; prescribe service or extensions thereof; fix rates and fares; supervise fis- cal affairs; authorize sale or lease of cer- tificates. | x |
| Colorado | 1915 | Public Utilities Commission | Passenger and property transportation. Within, out from and into municipalities. | Permission from municipal- ities to operate. Certificate of Public Convenience and Ne- cessity. | Wide control over issuance of Certificates. Grant or withhold Certificate of Public Convenience and Necessity. Street rail- road companies may acquire, own and operate motor vehicles for hire. | Special registration fees for passenger- carrying motor vehicles: Seating a pass. or less, \$20; for each additional seat of capacity .....\$1 |
| Connecticut | 1921 | Public Utilities Commission | Passenger transportation only. Within, out from and into municipalities. | Certificate of Public Conven- ience and Necessity. Indem- nity insurance based on seat- ing capacity; range \$5000 to \$10,000 per vehicle. | x | Extra registration fees as follows: Regu- lar fees plus \$15 for vehicle with seating capacity of 5 or less; over 5 but under 21, \$2 per seat over 5; 21 but under 41, \$5 per seat over 41; 41 or over, \$10 per seat over 40. |
| Delaware | x | x | x | x | x | Special registration fees: For passenger- carrying vehicles: seating capacity 7 or less, \$5 per seat; over 7 but less than 17, \$7.50 per seat; 17 or over, \$10 per seat in addition to 75 cents per 100 lbs. gross weight of vehicle and load. For property- carrying vehicles, \$1.50 per 100 lbs. gross weight on pneumatic tires; \$2.25 per 100 lbs. on solid tires. |
| Florida | x | x | x | x | x | Special registration fees for passenger- carrying vehicles with a seating capacity of ten or more, \$75. |
| Georgia | 1917 | Railroad Commission | x | x | The Commission holds that it has juris- diction over motor vehicle common car- riers, but has not as yet had occasion to exercise this power. x | Extra state tax on property carrying ve- hicles not operated exclusively within a municipality. Gross weight 12,000 lbs. or less, one cent per mile; over 12,000 lbs., two cents per mile. On passenger carry- ing vehicles gross weight 12,000 lbs., or less, 1/15 cent; over 12,000 lbs., but not more than 15,000 lbs., 1/6 cent; over 15,000 lbs., 1/6 cent per mile. |
| Idaho | x | x | x | x | x | x |
| Illinois | 1921 | Commerce Commission | Passenger and property transportation. Within, out from and into municipalities. | Certificate of Public Conven- ience and Necessity. Ade- quate indemnity insurance or sworn statement of ability to meet any possible damage claims. | Grant, refuse, alter, modify Certificates of Public Convenience and Necessity. Regulate rates, fares, service, contracts, practices, etc. | x |
| Indiana | x | x | x | x | x | x |
| Iowa | x | x | x | x | x | x |
| Kansas | x | x | x | x | x | x |
| Kentucky | x | x | x | x | x | x |
| Louisiana | x | x | x | x | x | x |
| Maine | 1921 | Public Utilities Commission | Passenger transportation only. Within, out from and into municipalities. | Certificate of Permission. | Make rules and regulations governing operation; fix fares, regulate routes and schedules, etc. | x |
| Maryland | 1916 | Public Service Commission | Passenger and property transportation. Within, out from and into municipalities. | Annual Permit. | Grant or refuse permits. Make rules and regulations governing operation. Fix rates, fares, schedules, etc. Provide for safety and convenience of traveling and shipping public. | Special registration fee for passenger car- riers: 68 cents per hp. plus \$2 per passen- ger up to 8; \$3 per passenger, 8-25; \$5 per passenger over 25. Extra State Registration fee amounting to 100% over normal fee. Special fee \$1.20 per hp. |
| Massachusetts | x | x | x | x | x | x |
| Michigan | x | x | x | x | x | x |
| Minnesota | x | x | x | x | x | x |
| Mississippi | x | x | x | x | x | x |
| Missouri | x | x | x | x | x | x |
| Montana | x | x | x | x | x | x |
| New Hampshire | 1916 | Public Service Commission | Passenger transportation only. Within, out from and into municipalities. | Permit to operate. Indemnity bond of \$500 per vehicle plus \$100 per person of seating ca- pacity. | Grant or refuse permits. Establish reasonable rules and regulations governing operation. | x |

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(1) That granted motor transportation for hire is a public utility, public interest can best be served by unrestricted competition and complete freedom from regulation in which none but the fittest can survive. This policy they contend will yield to passengers and shippers the maximum of results with the minimum of cost.

They deny any analogy between motor vehicle common carriers and railroad and trolley transportation agencies, pointing out that the latter by virtue of private ownership of franchises, rights of way, road beds, tracks and terminals have an exclusive and monopolistic control over all transportation on their routes. Motor truck operators, on the other hand, even where granted a monopoly of transportation for hire over a certain prescribed highway or portion thereof cannot deny the use of that highway to others who wish for themselves or as private carriers to transport persons or property over those same routes.

Finally, they point out that governmental regulation of rail and trolley common carriers came after these agencies had abused their rights and privileges and through pools, stifling of competition, exorbitant increase of rates, discrimination, stock watering etc., made it necessary for the public in self-protection to subject them to control. By the very nature of the service these evils are impossible with motor transportation since the road is free to the use of everyone and motor vehicles the medium for transportation over the roads are quickly, cheaply and in unlimited numbers available for everyone.

(2) Since the obvious outcome of the first argument advanced against state regulation is "cut-throat" competition between various forms of transportation attempting to serve a certain territory and per se between the motor transportation companies themselves operating in competition over certain highway routes, the opponents of state regulation cannot escape the query whether they are willing to face the logical consequences of such a struggle. Without hesitation they answer that wherever rail, trolley or any other form of transportation for hire cannot stand up before a newer and better form, public interest demands that it should give way; likewise within that newer and better form of transportation, the rule should be survival of none but the most efficient and economical agencies. They are confident that even though such a policy may mean the destruction at times of more or less invested capital, as it did when rail and inland water transportation first came into acute competition, the final economic benefits to the community as a whole will many times compensate for the loss involved.

(3) As for shouldering upon motor transportation for hire financial and other burdens which it should rightly carry, opponents of state regulation say that legislative bodies have not heretofore found it necessary to establish such control in order to determine the weight limits for motor vehicles used as common carriers; their registration fees and other charges; their liability to the pub-

lic for injury to persons or damage to property; etc. If this is all that is involved it is not sufficient to warrant almost unlimited regulation in all other respects by a state agency.

(4) Lastly those against state regulation believe that the natural working out of economic laws will do more to stabilize the motor transportation for hire business than extensive interference on the part of governmental agencies of any sort. They feel that the proposition is paternalistic and will result either in discrimination in favor of one or more types of transportation, and against all the rest, or else that it will promote monopolistic advantages for certain motor transportation companies and that through it all the traveling and shipping public will pay the cost.

Pending Legislation.

In even numbered years the activities of state legislatures are relatively light since no more than 11 or 12 state law making bodies get together in regular session while few of the others meet in special session. Notwithstanding this fact 1922 is producing a big crop of bills dealing with motor vehicle common carriers. The Arizona state legislature now in special session and the current regular sessions of the Maryland, New Jersey and New York state legislatures are considering extensions of the existing powers of their state agencies exercising control over motor vehicle common carriers. On the other hand in Kentucky, Massachusetts, Mississippi, Rhode Island, South Carolina and Virginia where the state legislatures are in regular session, and where as yet there is no such regulation, many measures aiming to bring about a greater or less amount of such control are now receiving the careful consideration of the legislators.

In this connection it is interesting to note that in New Jersey the strongest and most active opponents of state regulation and the extension thereof, have introduced and are striving to bring about exclusive power in the premises for the local incorporated municipalities. Apart from any other arguments pro and con for such local control, it must be apparent that the operation of a motor vehicle common carrier beyond the confines of a single municipal jurisdiction of a state becomes extremely complicated and burdensome under such circumstances and is likely to suffer from the varying policies of constantly shifting local governing bodies.

Another interesting movement to note in some states is proposed legislation to require every common carrier motor vehicle engaged in the transportation of passengers to have both a front and rear entrance, while in Maryland a pending measure would require not only a chauffeur but also a conductor on every such vehicle. This would seem to indicate that some state law makers seek to rewrite in motor bus transportation the full crew laws which for a long time have been an economic burden for the railroads.

Position of Conference Committee.

The motive of this discussion of state regulation of motor vehicles used for hire

is informative only. It is not intended and in no way must be regarded as favoring either one side or the other of the question. For this reason the conference committee will appreciate greatly any information; arguments pro and con; comments; corrections or criticisms which all those who read this discussion may have to offer, especially if such material includes the practical experiences that have resulted from regulation by the states where it is now in force. How important this is can be seen from the fact that in 1923 the legislators of 42 states will meet in regular session and doubtless be called upon to make decisions on scores of bills vital to motor vehicle common carriers. The conference committee hopes at that time to be of service in laying before all concerned facts and arguments which will facilitate the passage of only such laws as are scientifically correct and fair alike to motor vehicle common carriers; competing common carriers and the public.

From a preliminary report based on state laws in force Jan. 1, 1922, and on bills pending before state legislatures in session March 1, 1922.

Publication authorized by Motor Vehicle Conference Committee, 366 Madison avenue, New York.

American Automobile Association, Motor & Accessory Manufacturers Association, National Automobile Chamber of Commerce, Inc., National Automobile Dealers' Association, Rubber Association of America, Inc., Trailer Manufacturers' Association of America.

Frank King is no longer works manager for the Holcomb & Hoke Mfg. Co., Indianapolis, but is now filling the position of factory manager for the Dearborn Truck Co., Chicago.

A. L. Morgan has accepted a position as draftsman for the Parker Motor Car Co., Montreal, Quebec. He was formerly chief engineer for Charles W. Burroughs, also of Montreal.

J. D. Hammond is now a draftsman for the Detroit Motor Co., Washington, Pa. He was previously maintenance superintendent for the Hayes Wheel Co., Jackson, Mich.

William Schroeder, formerly chief engineer for Karry-Lode Industrial Truck Co., Long Island City, N. Y., now holds a similar position with the Eleveyor Electric Industrial Truck Co., Brooklyn, N. Y.

William F. Goff has severed his connection as engineer for the Sullivan Motor Truck Corporation, Rochester, N. Y. He has not announced his plans for the future as yet.

F. E. Fick, formerly connected with the tool engineering department of the Warner, Swasey Co., Cleveland, has become automobile design checker for the White Co., also of Cleveland.

George W. Cravens has been elected president of the Climax Engineering Co., Clinton, Iowa.

F. C. Moore has been elected president of the Canton Forge & Axle Co., Canton, Ohio. He was previously vice-president and general manager of the Vermillion Malleable Iron Co., Hoopeston, Ill.

(Continued from Page 8.)

Insurance Viewpoint and Theft Problem.

"The automobile-theft problem from the insurance viewpoint includes in its defining lines, the following: (a) the automobile has become a utility, (b) which is generally available and (c) readily operated by the general public (d) without general comment; (e) the automobile readily lends itself to illegitimate use by the irresponsible joy-rider, (f) to organized theft for profit in the sale of stolen cars and (g) to vicious purposes to which the use of stolen automobiles is secondary. If this be the problem, it appears that features (a) to (d) will continue to grow with the industry. A job which does not have a general-utility value will not be a "commercial" proposition from the thief's viewpoint. As production schedules increase, more cars become available to the thief. A design that is not operable readily by the general public will have a limited legitimate distribution and likewise a restricted stolen car sale-value. Only special bodies or freak jobs attract attention now. Accordingly, preventive or protective measures against the insurance losses from the theft of automobiles must take the direction of retarding their availability for illegitimate uses, and not combat the items that reflect the growth and prosperity of the automobile industry.

Theft Retardants.

"It is pertinent to emphasize the use of the word "retard" in contrast with "prevent" or "protect." The property of mobility being a primary essential of the automobile prevention of theft while mobility persists is not possible, generally speaking. This has been recognized by Underwriters' Laboratories by the classifying of automobile locking devices as "theft retardants". It is believed futile to proceed on the theory that prevention is practical. In studying the sources of automobile thefts a clear distinction becomes evident immediately as to the efficiency necessarily demanded of retardants protecting against (e) and (f) or (g). That such a distinction exists between (f) and (g) is not so clear; in fact, it may not exist within the bounds of practical procedure.

"The first locking device was the simple ignition-switch or plug having for its primary purpose a means for stopping the engine. This did not long suffice to prevent unauthorized use. Ignition-switches equipped with tumbler locks were the next development. Subsequently, a more general knowledge of the wiring systems used on various makes of cars have decreased materially the protection afforded by this type. Since 1915, various other locking means or methods have been developed. More than 100 makes, patterns or styles available as accessories are now classified by Underwriters' Laboratories and some 15 to 20 are being furnished regularly as stock equipment by automobile builders. The several methods of locking comprised in this group are:

- (1) Ignition circuit locked open.
- (2) Gasoline feed line locked closed.
- (3) Intake-manifold locked closed.
- (4) Exhaust line locked closed.
- (5) Shifting gear locked in neutral.

- (6) Shifting gear otherwise locked.
- (7) Clutch pedal locked in depressed position.
- (8) Steering-wheel locked in free position.
- (9) Steering-wheel locked in a fixed position.
- (10) Chains, clamps, bolts or other fixtures securing a wheel to the car frame, a lamp post or a telephone pole.

In at least 90 per cent of these devices, a cylinder lock with a key of the pattern commonly known as the Yale is used. On one well-known high-priced car locks were provided on the ignition-switch, spare-tire holder, tool-box hood clamps and at other points.

Make Keys to Fit All Cars.

"These several locks on each car were operated by a common key and there were but 10 key changes in the series; so access was necessary to only 10 cars to secure wax impressions for making a set of keys with which any car of this make could be stolen. The Detroit police once exhibited two complete sets of 50 keys each that had been taken from a thief. These covered the entire output of two popular makes of car. In view of such conditions, the present requirement of Underwriters' Laboratories for at least 200 key-changes will not seem severe. Hardware stores and locksmiths sell blanks for various patterns of so-called Yale keys; hence, our regulations call for keys with milled slots, duplicates for which cannot be secured in this ready manner. To prevent picking, tumbler locks must have not less than three pins, and, to avoid forcing, key-slots should be flush in the cylinder face. Locking cylinders must be mounted properly to prevent ready removal and set-screws must have riveted heads if used for this purpose. In a similar way the operations and mechanical details must be studied and limitations set up to avoid the easiest ways of installations and of removal, but the theft of cars cannot be prevented.

Locks Not Always Effective.

"An extreme method reported as having been employed several times by a gang of organized thieves is that wanted cars were spotted and the habits of the drivers learned. When a car was left alone, a furniture van would be drawn up, a ramp would be lowered and the car hauled by a winch into the van. With the car inside the closed van would disappear. There is a practical limit to what can be demanded of locking devices. Given time, tools and freedom from apprehension, any locking device practical for use can be defeated. Some damage to car fixtures may result, but never to the extent of eliminating the profit to a thief.

"It is believed that where the idea of money gain is not present, the regular use of a locking device of a type listed by Underwriters' Laboratories is effective in preventing the theft of cars for joy-riding, and that the regular use of such locking device is more than 50 per cent effective in causing commercial stealing to be confined to cars not so equipped. The use of standard locking devices is likewise not less than 50 per cent effective in defeating thefts when

attempts against cars so equipped are actually made. Considering the number of stolen cars which are not equipped with modern standard locks and others stolen while left unlocked by the owner, an actual "fielding average" of 80 per cent or better is claimed for the present listed types and patterns.

Volume of Automobile Thefts Insurance.

"Detailed statistics as to underwriting experience or volume in automobile theft insurance, are not available. The following figures are deduced from data given in automobile editions of several insurance publications. Approximately 350 insurance companies write automobile theft insurance. Because of the limitations placed upon insurance practices by the state law and restrictions, this insurance is never written except as a side line of automobile fire insurance. In 1920, these companies assumed a theft liability of several billion dollars for an estimated premium of about \$60,000,000. The figures show what is called an underwriting loss for the business, from which a computation can be made showing a distribution of this \$60,000,000 premium income as given in table 1:

Table 1.—Distribution of Premium Income.

| Items of Cost | Per cent. | Amount |
|--|-----------|--------------|
| Sales Expense | 25 | \$15,000,000 |
| Overhead and General Operating, including reserve requirements | 20 | 12,000,000 |
| Defection and Adjusting Cost | 5 | 3,000,000 |
| Taxes | 4 | 2,400,000 |
| Payments on Claims. | 55 | 33,000,000 |
| | 109 | \$65,400,000 |
| Net Loss | 9 | 5,400,000 |

"It is purely coincidentally that by a similar course of reasoning I conclude that of 9,000,000 automobiles registered for 1920 not more than 5,400,000 are covered by any form of insurance protection, showing an average underwriting loss of one dollar per car.

Theft Loss \$2.00 Per Car.

"But when we consider that companies writing only public-liability insurance, without the theft coverage included, take at least 40 per cent of the total automobile premiums collected, the estimate shows not only an average underwriting loss on the theft business alone of about \$2 per car, but, in addition, cash actually paid out for claims of at least \$10 per car insured against theft. This indicates an assumed number of cars insured against theft of approximately 3,000,000, with an average premium of \$20 per year and an average face value of \$1000 per policy, or an average rate of 2 per cent after all deductions.

"But what is the significance of these admittedly questionable figures in explaining the underwriting loss, which has been referred to as averaging \$2 per car for theft alone? The rate of allowance, not including the penalty for a labeled locking-device policy-warranty of 15 per cent produces for an average car a reduction of \$3.50 per year. This amount is sufficient to take care of the underwriting

(Continued on Page 31.)

ACCESSORIES DEPARTMENT

Carbon Cleaner Brush is designed for scraping the carbon. It is said this little brush will be found very effective, as it will remove carbon as well if not better and more quickly than can be done with

tempered wire and with a strong, well-fitted handle and nickel plated ferrule.

The manufacturer states that when properly used this brush will last a long time and will more than pay for itself



scrapers. It conforms to all curved surfaces, fits into the corners and gets into the pores of rough surfaces of unfinished castings, so that no carbon is left to start a new deposit. It is made of highly

in cleaning the carbon from one motor. The retail price is 50 cents each.

Manufactured by Worcester Brush & Scraper Company, P. O. Box 754 B., Worcester, Mass.

Reed Inside Micrometer Caliper is generally used in obtaining internal measurements of cylinders and rings. It is equally useful in taking linear measurements, testing for parallel surfaces, comparing gauges, making comparisons for fits and setting calipers.

In the construction of the barrel, spindle and thimble of the micrometer, the regulation diameters of those parts found in the Reed outside micrometer are used.

It is said this tool is particularly adaptable to garage and repair shop use, as the larger surfaces allow for figures of a more generous size on the sleeve and barrel.

The tool is graduated to read to thousandths of an inch.

One feature is the possibility of instantly changing the position of the detachable handle to make it convenient for right or left-handed work, so as to always present the graduations on the barrel in view for easy reading. The handle makes it possible to take measurements in holes or other inaccessible places or to gauge throughout the entire length of a cylinder bore, thus giving a better average measurement.

With the wider range, or run of one inch, which is out of the ordinary in inside micrometers of this size, less time is lost in actual use than in the operation of a tool with shorter runs. Extra rods, fitted with anvils, allow for a quick change with less possibility of error than when several combinations have to be used to produce desired lengths. It is stated. These rods are interchanged by simply unscrewing from the threaded stud at the end of barrel. Each rod is internally threaded and ground square at the hardened end which sets squarely against the barrel shoulder, while the rod at point of measurement is fitted with a hardened tool steel anvil which can be adjusted to lengthen the rod and compensate for any



anvil wear resulting from constant use.

The anvil faces are ground on a comparatively small radius, making this inside micrometer especially adaptable for measuring parallel or curved surfaces.

All rods are properly adjusted to accurate measuring lengths before they leave the factory, and anvil adjustments should be made only after wear and when proper gauges for re-setting are at hand.

The standard set, packed in a paste-board box, consists of the inside micrometer, an adjusting wrench and five rods.

Together with the usual Reed guarantee of complete satisfaction, the exceedingly reasonable price makes the tool a very desirable and profitable possession.

Manufactured by Reed Small Tool Works, Worcester, Mass.

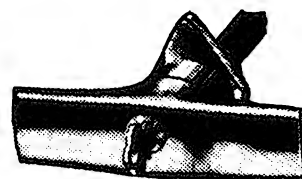
Cowles Door Locking Handles are designed especially for Ford Sedans and Coupes. Their careful workmanship insures perfect operation, and their artistic finish harmonizes beautifully with the lines of the car.

It is claimed these locking handles absolutely protect your car and contents from theft, allowing the owner to leave

robes, wraps, or other articles in the car with the assurance that they will be there upon his return.

The effectiveness of the Cowles door locking handle as a safety device is enhanced by a newly patented safety plate. When the handle is locked, this safety plate covers the screws that fasten it to the door, and so prevents the possibility of access to the car by removing the handle. The screws are never exposed except when the handle is unlocked and turned in opening the door.

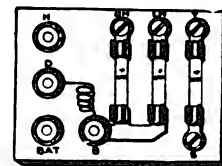
The handles are made to slip right into the place of the regular handle. The maker states that no cutting, filing, fitting



or finishing is necessary, simply remove a couple of screws, take out the ordinary handle, slip in a Cowles door locking handle, replace the two screws—and your car is equipped with this convenient, thief-proof, safety locking handle.

Manufactured by C. Cowles & Company, Water Street at Chestnut, New Haven, Conn.

Union Fuse Junction Block. This device is designed to protect the wiring on Ford cars. The block is installed on the dash and acts as a safety gate between the power plant and the wiring. When equipped with this block, a small fuse blows out when there is a ground, and prevents injury to the wiring or the lights. Burning out of the wiring on Ford cars, due to the grounds has been the cause of considerable trouble and expense to Ford owners. It

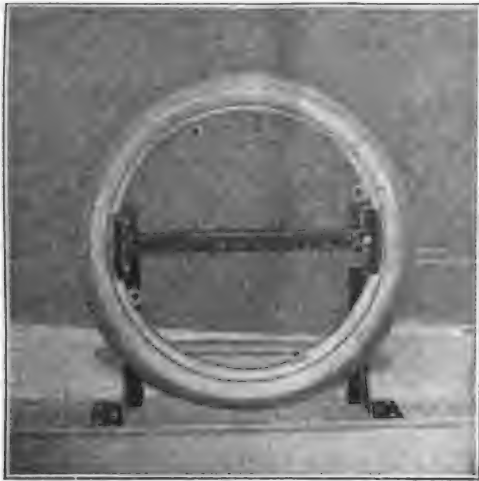


has often resulted in the necessity for entirely rewiring the car and even caused some fires to say nothing of the annoyance of being deprived of lights when some distance from a garage and being unable to purchase the right type of bulb. A way to remedy these troubles seems to have been found in this fuse block which in a case of this kind would only require a new fuse which can be carried and costs very little. This device should be widely appreciated by the Ford owners.

Manufactured by the Chicago Fuse Mfg. Co., Chicago, and distributed by the Mutual Service Corporation, 140 Cedar St., New York.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

Audet Tire Carrier Model "A" is for rear attachment. It is held with standard attaching brackets, and carries one



30x3½ or one 31x4 demountable tire. The rim is readily applied by removing the pressed steel clamp at the right with a standard lug wrench. When rim is placed on carrier, the clamp is applied and securely held with the nut. A lock can then be applied through the steel eye which protrudes through a slot in the clamp. Whether a lock is used or not, the rim is perfectly secure.

A feature of this tire carrier is its lightness of weight, still it possesses great strength. No riveting is required to attach it to the car. It is also claimed there is nothing to rattle or lose in shipment and no holes to drill in its installation, while it affords absolute security and will accommodate any type of 30x 3½ demountable rim.

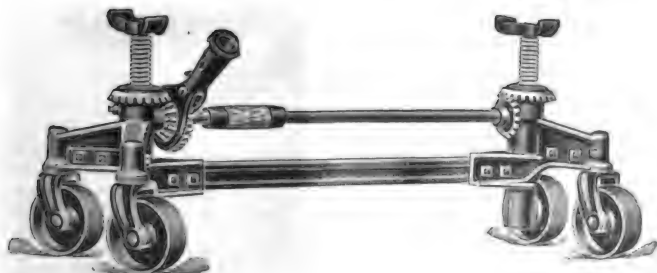
This carrier is shipped in single lots or in crates of six or twelve, complete with bolts to attach to the frame. The shipping weight will average about eight pounds to the carrier. Single carriers can be shipped by parcel post. The Audet Carriers are all finished in a handsome black baked japan, and give a very neat appearance to the car itself. They are sold with an absolute guarantee.

The price of the Model "A", complete with attaching brackets, \$3.00; extra attaching brackets, per pair, \$1.50.

Made by the Audet Novelty Manufacturing Company, Williamsport, Pa.

Pratt Four Wheel Jack has two wheels installed at each end. This affords practically unlimited stability to the jack when in the operation of lifting a car. It also allows the jack to be more easily handled and eliminates the possibility of a sudden jar causing an accident.

This jack is operated by an extension lever which transmits the power exerted upon it to a pawl and ratchet, which delivers the power through bevel gears to



the vertical screws. Ball bearings are installed to eliminate to the greatest extent possible the loss of effort caused by friction. Shafts are made of a good grade malleable iron and machined to a

perfect running fit. The jacking screws are operated by bevel gears, the holes of which are threaded to receive them.

The manufacturer lays great stress upon the lack of complicated parts in his product and claims they are so compact that they occupy very little room when not in use, and the simplicity of design allows anyone to operate them.

Manufactured by William E. Pratt Manufacturing Company, Chicago, Ill.



Twin Fire Spark Plugs are said to create two distinct, double intense sparks at the proper moment. The additional flame is also said to insure snappy, powerful explosion of low-test gasoline and easier starting.

When using these plugs the electric current enters the plug through the center electrode, arcs across the first gap to the intermediate electrode, which is insulated on the lower tip of the porcelain, then to complete the circuit, arcs across the second gap to the ground electrode.

It is claimed should a flake of carbon or drop of oil "short" either gap, the spark at the other gap would continue to ignite the gas, and the hot explosions would soon burn the oil or carbon from the clogged gap. Ordinarily, both sparks occur simultaneously.

The electrodes of this plug are made from a manganese nickel alloy for the purpose the material found by extensive tests to be best suited.

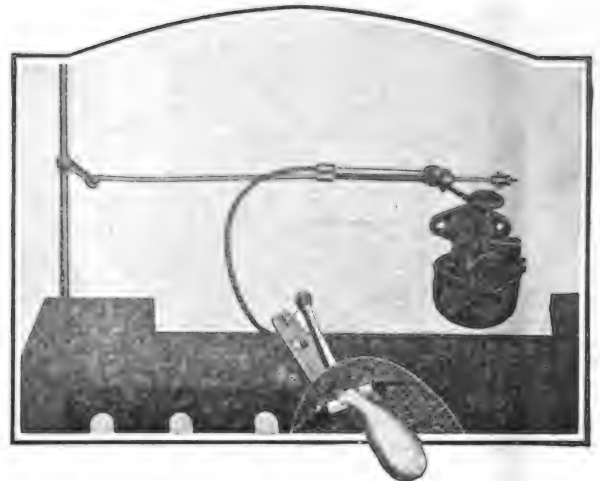
Another feature is that the plugs can be easily taken apart for cleaning should that become necessary.

The maker guarantees the plugs against defects in material or workmanship.

Manufactured by Twin Fire Spark Plug Company, Detroit, Mich.

Williams' Foot Accelerator gives a Ford the same driving conveniences enjoyed on

can rust or tarnish. The aluminum pedal adds materially to the appearance of the car.



The accelerators are packed in a box 12 and 36 in a case; and weigh in case lots less than one pound each, packed for shipment.

The Williams Brothers guarantee to replace any part made worthless through wear or defect in materials that may develop in six months of the hardest usage that the Williams Foot Accelerator may receive.

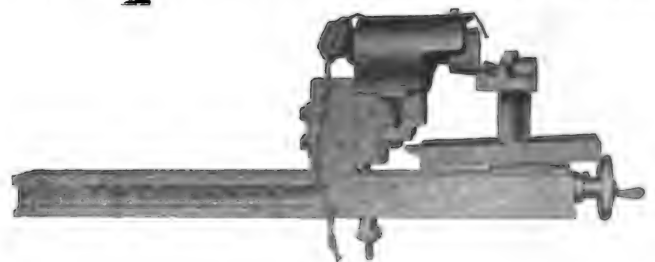
Manufactured by the Williams Brothers Aircraft Corporation, San Francisco, Cal.

Weber Crank Pin Re-Turning Tool is a simple, yet accurate and fast working device intended primarily for the trueing up of pins on all automobile and truck crankshafts.

Without altering this tool in any way, an electric cutter-grinding equipment driven by a Westinghouse Electric 1/12 horsepower, 10,000 revolutions per minute motor can be conveniently attached and the cutter of the tool is ground in from two to five minutes. The end thrust of the motor shaft is adjusted by the same collet which holds the wheel. The cutter to be ground is passed in the groove of the guide blade with the fingers and micrometer adjustments are made by the hand wheel and dial of the tool. The simplicity of the adjusting features make the equipment especially attractive.

The tool itself when in operation rides around with the crank pin. The handle, however, rests at all times on the bed of the lathe. The cutting tool is fed into the pin by means of a hand wheel at the end of the tool.

The wheel has a dial below it that is graduated into one-thousandths of an inch. This dial can be locked, by means of a set screw, in any position, thus making it easy to turn all the pins to exactly the same size. The cutter is securely clamped in a V slot. It is parallel to the back plate at all times, thus generating a



true circle. On the V blade there are graduations which are used in setting the block for different diameter pins.

Manufactured by Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.

larger cars, it is claimed.

The manufacturer states the accelerator is constructed of the best grades of aluminum, brass and steel spring wire. Built like a spring, vibration does not affect it.

The parts cannot work loose. Nothing

(When Writing to Advertisers, Please Mention the Automobile Journal.)

Universal Radio Battery is being manufactured to answer the public demand for a high grade product in this line. After much experimenting with the vari-



ous methods of battery building in search of the proper type and arrangement, the Universal Radio Battery has been placed on the market by a very reliable manufacturer.

This battery is easily portable, not weighing over 40 or 50 pounds, and is equipped with a good reliable handle to carry it to any position where it may be needed. As the heart of a battery may be said to be in the plates the battery is composed of, the Universal Batteries are made with the positive plate 3/16 of one inch in thickness, while the thickness of the negative plate is made 5/32 of one inch.

There are three types of batteries which the Universal Company recommend to the radio fan, anyone of which it is claimed will give good and efficient service.

Manufactured by Universal Battery Company, 3410-24 South La Salle Street, Chicago, Ill.

Defiance Robe Lock is made in such a form that it readily locks robes, coats, blankets, or suit cases to the robe rail. It also may be used to lock the gas and spark levers on the steering wheel, thereby affording a valuable protection for the automobile when the owner is compelled to leave it parked in any place.

The lock is quick acting in its application to any thickness of material. When it is unlocked the spindle may be slid along to any position the shape of the object being secured requires, then the key can be inserted in the lock and the spin-



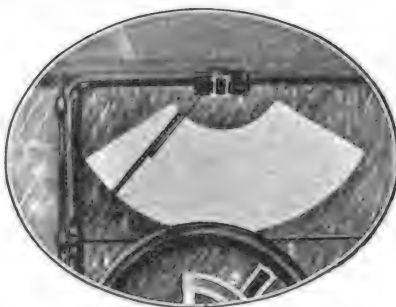
dle securely fastened in this position. This rapidity of adjusting the lock is made possible by a series of notches cut into the locking spindle, which are engaged by the locking mechanism of the appliance.

This device makes a valuable addition to the equipment of any car. It is artistically finished with a heavy plating of nickel, insuring it against rust and corrosion. It is equipped with an eight-tumbler lock which has no master key it is claimed. This type of lock makes the possibility of the lock being opened without the proper key exceedingly improbable. The price of the lock with two keys is \$3.

Manufactured by Universal Products Company, 16 California Street, San Francisco, Cal.

Mayo Skinner Automatic Windshield Cleaner is worked by the engine. It is claimed to provide for perfect vision automatically, during the most severe rain, snow or sleet storm, leaving both hands free to control the car. It is worked by suction from the engine or the vacuum tank. In order to start it operating a little needle valve on the vacuum motor which is installed on the windshield frame is turned and the cleaning arm, or wiper, starts with the regularity of a pendulum—back and forth. It works continuously, giving perfect vision to the driver as on a clear day. After once started it continues to operate until shut off, fast or slow as desired.

It is easily and quickly installed. This automatic windshield cleaner is a great dealer proposition, it is said, as one model



fits all cars and the outfit is supplied with fittings for both open and closed cars, also simple directions for installing. For closed cars the vacuum motor is attached to the windshield by drilling three holes through the frame. For open cars it is attached to an adjustable clamp which fits all different styles of windshields. A small rubber tube is run from the vacuum motor and attached to either the vacuum feed tank or the intake manifold by drilling a 1/8-inch hole and inserting a little brass pipe—all such equipment is furnished with the outfit. The cleaner arm, or wiper, is easily adjusted.

The manufacturer guarantees it to oper-



ate satisfactorily for five years, and claims that once installed the outfit will give service almost indefinitely without any attention whatever. The installation will in no way interfere with or injure the automobile engine.

The outfit is furnished complete with fittings ready for quick installation, full directions and a diagram showing the proper method of attaching both to the windshield and the automobile engine.

List price, \$7.25 each; dealers' price, \$5.10 each; dealers' price, dozen lots, \$48.

Manufactured by the Mayo-Skinner Manufacturing Company, 2115 Elston Avenue, Chicago.

Marvel Ford Bullet Side Lamps are readily attached to the Ford car without the services of a garageman or mechanic. They are said to improve the appearance of the machine without in any way weakening any of its parts, by new holes being drilled. With these lights installed it is not necessary to have dimmer lights on the car, or to use them if they are already installed, as the bullet side lights answer this purpose just as adequately as any dimmer lights, it is claimed.

In order to install these lights on either the 1920 or 1921 car it is only necessary to remove the lower windshield body bracket bolt and place in this hole the threaded stud that is attached to the bullet side lamp. Then put on the lockwasher and nut and tighten them, holding the side lamp in the position required, while

doing the tightening. The stud on the lamp then answers a two-fold purpose of holding the windshield and lamp at the same time.



Plenty of cable is furnished with the lights to attach them properly to the switch it is stated. The lamps may also be purchased with green and red lenses. These lamps measure 2 1/4 inches across the front diameter and are 3 1/4 inches in length, 12 pair being packed to the carton. The price of a pair finished in nickel is \$5, while those finished in black are sold for \$4.50.

Manufactured by American Auto Lamp Company, Incorporated, No. 20 Desbrosses Street, New York City.

"Hushadoor" is a door cushion for motor cars, which operates on a novel, double-cushioning principle.

The mechanical features of the "Hushadoor" are simple but unusual. Two small but powerful springs are anchored within the plunger box. Upon them the recoil of a heavy black tongue of extremely resilient rubber is taken. Thus the checking action, or "spring" of the rubber, is reinforced by that of the springs—and the compensating expansion is naturally effective in holding the closed door rigid against vibration and rattling.

Advantages claimed for the new device by the Velguth company are: That it is the smallest, most compact door cushion on the market—fitting perfectly flush into its recess; that it is more than powerful enough to take up the heaviest slam; that it has double compensating "rebound" or expansion, which holds the door solidly and firmly against all road and motor vibrations; and that it never wears out, because of the double-cushioning principle.

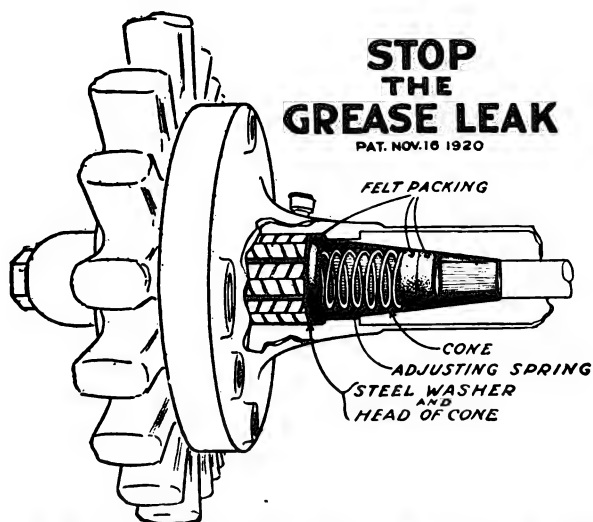


In addition the design of the "Hushadoor" is such that it can be used as a replacement for any of the conventional type door bumpers that are being used today. The plate is of sufficient size to entirely cover the opening which is left when the old style door bumper is removed.

This device is furnished either in black enamel, nickel plate or in the natural metal.

Manufactured by the Velguth Metal Parts Company, Milwaukee, Wis.

(When Writing to Advertisers, Please Mention the Automobile Journal.)



R. & R. Automatic Grease Retainers are made for Ford and Chevrolet cars.

They prevent the grease leaking through the housing into the brakes and onto the tires, it is claimed.

These grease retainers put no wear on the axle and have only one wearing part, which is the smaller pair of felt washers that are held tight at all times by a retaining spring. This spring also automatically takes up the wear. The spiral spring presses against the steel washer and the small felt washers inside the cone. This keeps an even tension on all felt washers, preventing any leakage of grease outside or inside the cone.

It is stated the retainer can be installed by the owner himself in a few moments, as it requires no special tools or mechanical skill.

You simply remove the wheel and roller bearing. (It is not necessary to pull roller bearing bushing.) Insert the R. & R. Automatic Grease Retainer, replace roller bearing, original Ford cap, felt and wheel and the job is done.

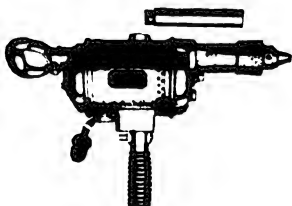
A set of R. & R. Automatic Grease Retainers comprises two complete retainers and are interchangeable. A set retails at \$2.50 and can be carried home in a man's pocket, it is stated.

Manufactured by the Macorvey Company, Wabash Building, Pittsburgh, Pa.

Garage Special Drill is a new light weight, ball bearing, portable electric drill designed for the particular use of garages and auto repair shops.

The new drill has a capacity of $\frac{1}{2}$ inch in steel. It weighs only 14 pounds and carries a universal motor for use on either direct or alternating current.

The drill is equipped with a Jacobs



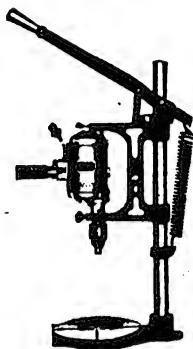
Chuck, an extra detachable side handle and 10 feet of cable with Hubbell attachment plug. A mandrel with 3" x $\frac{1}{2}$ " grinding wheel to insert in the chuck for light grinding, is furnished as an extra.

The entire motor frame, switch handle and end handle are made of aluminum. The motor windings are fully enclosed, dirt and dustproof and all working parts are protected. The motor is air-cooled by means of a fan mounted on the armature shaft.

High grade annular ball bearings support both ends of the armature shaft. A ball thrust bearing is provided for all end thrust. The chuck spindle is carried

by a phosphor bronze bearing of ample size to withstand irregular drilling pressure.

The switch is of special patented design of the quick make-and-break type with 50% overload allowance, it is claimed. It is enclosed in the handle



of the drill and is operated by means of a push button through the handle.

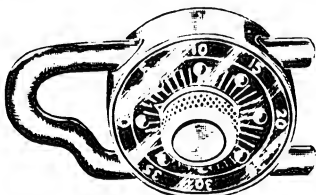
Gears are manufactured of a special analysis steel, heat-treated and hardened, being carefully enclosed and operating in grease.

The selling price of this drill is \$65.00 to the user.

Manufactured by Cincinnati Electrical Tool Company, Cincinnati, O.

Steel Spare Tire Lock is a specimen of mechanical skill. It is claimed to be absolutely fool proof and trouble proof, operating smoothly, conveniently, and quickly. As this type of lock works on the principle of the combination safe lock there is no need of removing one's gloves to operate it.

The lock is sturdily built of a good quality brass, thus making it rust proof throughout its entire construction. Each lock is fully guaranteed and it is stated

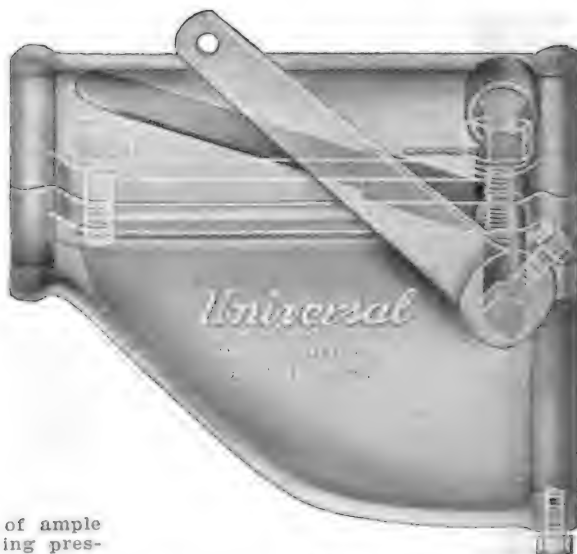


any one of them will stand a crow-bar pressure of 850 pounds.

The fact that the lock dispenses with the need of keys which ordinarily might be lost, is decidedly advantageous. No two of the combinations are alike and each setting of the lock affords an entirely different reading, making it a lock for every purpose.

Complete particulars will be furnished by the Triple Metals Corporation, Department H 5, Waukegan, Ill.

(When Writing to Advertisers, Please Mention the Automobile Journal.)



Waller Universal Heater Cut-Out is designed along practical lines for use on all cars. The heater attachment makes it ideal for the open as well as the closed car. It is said a heater attached to this make of cut-out really heats, as the entire exhaust can be thrown through the heater. All that is necessary to attach a heater to the cut-out is to slip a piece of flexible tubing into the opening of the cut-out and fasten it with the set screw.

This appliance is made in two pieces and is easily installed, as it is not necessary to cut any pipe in two, thus weakening the pipe.

The flap of the cut-out is made of heavy steel and is machined to a perfect fit. The flap is set in inclined position and is niched so as to fit snugly on the inside of the exhaust pipe. When this flap is opened it completely shuts off the line to muffler.

The entire cut-out is made of high grade cast iron and the lever for opening it is of malleable iron.

Manufactured by Waller Manufacturing Company, Oelwein, Ia.

Soss Grip-Tite Curtain Lights consist of a two-piece aluminum die cast frame, the halves of which are fitted perfectly together.

The special nickel plated oval head screws which hold the two halves of the frame together are pointed, and pierce the fabric very easily when the light is being installed.

The special Grip-Tite feature consists of points on the inside of each half of the frame which dovetail into recesses in



the other half. This insures a positive grip on the curtain and prevents the cloth wrinkling, sagging or pulling out.

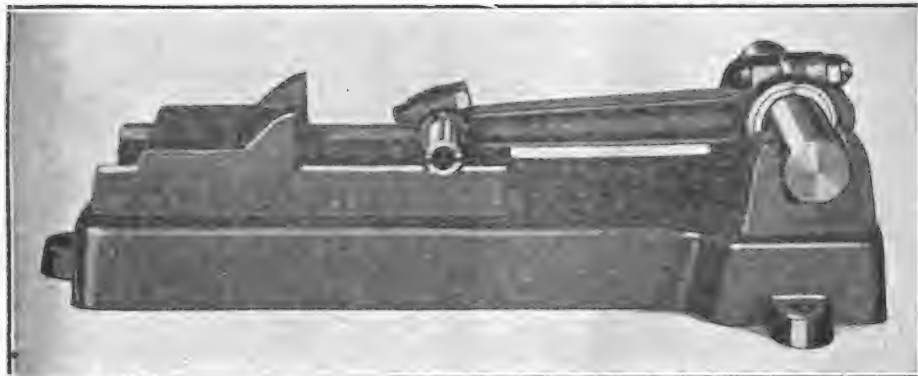
The manufacturer claims that the sections are accurate in every detail and will line up properly when installed.

The frames of these lights are made from special nickel aluminum rust proof alloy, and are ground and highly polished it is stated.

A rubber gasket is fastened around the edges of the clear crystal glass, which prevents the glass from cracking when the screws are tightened. This rubber gasket also makes the Soss Grip-Tite curtain light, water proof and rattle proof.

Manufactured by the Soss Manufacturing Company, Brooklyn, N. Y.

Waller Connecting Rod Aligning Jig is made for all makes of cars, trucks and tractors. The sliding leaf and bed of this device are machined perfectly parallel with the mandrel, thus assuring the greatest accuracy in aligning the rod. The



Jig is so designed that the slightest twist or bend can be detected with one operation, and is so constructed that the rod may be straightened without removing from the jig.

Bushings are used for the different

crankshaft sizes except the Ford. The arbor furnished with the jig is the Ford size and the bushings slip over this arbor. With this fixture you can bend or twist the rods in the jig, it is claimed, without the necessity of taking the rods out of the

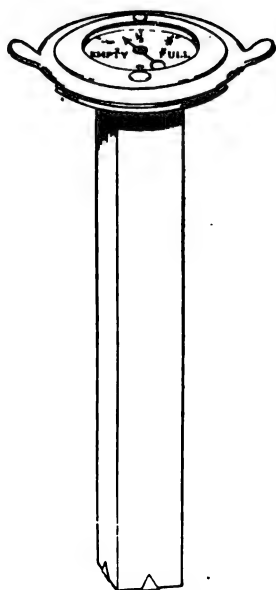
jig and putting them in a vise to do this work.

Detection of error is simplified whether the rod is bent sideways or twisted.

Made by Waller Manufacturing Company, Oelwein, Ia.

Tasco Visible Gasoline Gauge is a device which eliminates the troublesome methods necessary to ascertain the amount of gasoline in the tank of a Ford car without the necessity of the measuring stick and its attendant uncertainty.

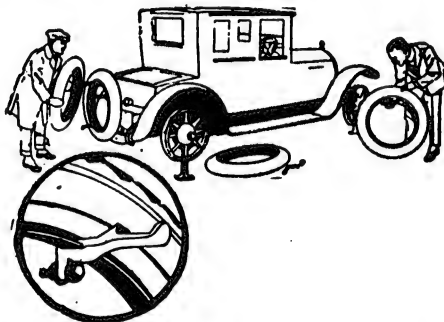
This gauge is made to fit the screw that the filler cap usually occupies, so the installation of the device is extremely simple. To equip the car with this device it is necessary to remove the original filler cap and screw the Tasco gauge in its place. This is all the effort that need be expended as the gauge immediately registers the amount of gasoline in the tank. When the motorist wishes to ascertain the amount of gas in the car, the cushion is removed and the reading of the dial taken at a glance.



Tasco gauges are made in three different types. Type A is made to be used on the old style roadster and the old style touring car. Type B is of medium length and is to be used on the new oval tank of the touring car and roadster, also the tank of the coupe. Type C is the short length and is to be used on the sedan. The list price of these gauges is \$1.00.

Manufactured by Akron Selle Company, Akron, O.

Erp Spare Rim Carrier is a set of three iron arms or clamps which are bolted on the original rim band of the tire rack found on the car. The arms are placed in a triangular position on the rim band so that two are at the top and the other at

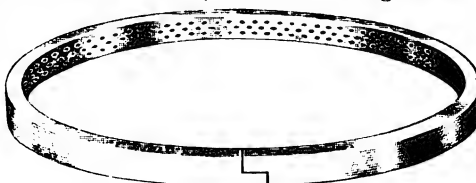


the bottom center, as shown in the illustration. The arms are so shaped that the rim of the second spare fits snugly in place so that it forms an inside grip on the second spare tire. It is impossible for the second spare to run against the first spare, thus preventing any chafing and keeping both spares in perfect condition.

No extra tools of any kind are needed to install the Erp spare rim carrier, as fingers and an ordinary monkey wrench will do the work. Both spares can be removed or attached without removing the device. This second spare tire carrier retails for \$3.50. Many motorists, who practise tire economy, find that by changing tires once in a while the tires will last longer, which can be done more easily when they carry two extras.

Manufactured by the Sedgwick Sales Company, 1405 Sedgwick Avenue, New York, N. Y.

Bear-Tite Piston Rings have been adopted as standard equipment by a number of manufacturers of the highest grade cars and used by them for the past several years with unvarying success, it is claimed. They are now being intro-



duced to the car owner. These rings are the result of careful development covering several years of exhaustive tests. The experiments, coupled with the experience gained in having cast as many as two million individually cast piston rings per month, has enabled the maker to turn out in Bear Tite Rings a product of the highest merit.

Patented Bear-Tite Rings are manufactured complete from the raw material to the finished state in the factory of the manufacturer. It is said both the



foundry and machining departments are looked upon by the trade in general as one of the most modern in the automotive industry. Special and costly machinery has been designed and built right in the plant, embodying labor saving devices and the most up-to-date methods of manufacturing their product to the closest limits of accuracy. Bear-Tite rings already have a large and increasing sale with the car manufacturer, also with the jobber and dealer, it is stated, and will, undoubtedly, be a big factor in the piston ring industry in the near future. There is an excellent policy back of the ring whose reputation is backed by 87 years of experience.

Manufactured by Foster Merriam & Company, Meriden, Conn.

Vesuvius Protector and Intensifier fits any spark plug and allows the spark to be seen.

This protector and intensifier fits right on top of the plug and the body protects the insulator, while the top acts as an intensifier.

The spark may be observed through a hole on the top. The jumps occur between the little pointer in the chamber of the device and the wall which secures it to the spark plug.

It is claimed trouble is readily detected, for if the spark does not jump at the gap



it is then necessary to verify your wiring or your source of current.

It is claimed even carbonized plugs will work with the protector. The current, while it is being built up, cannot leak over the carbon as it is held at the intensifier points until needed.

When the pressure of the current becomes strong enough to jump the intensifier gap its speed is so great and its power such that it forces its way through between the spark points though insulated with oil.

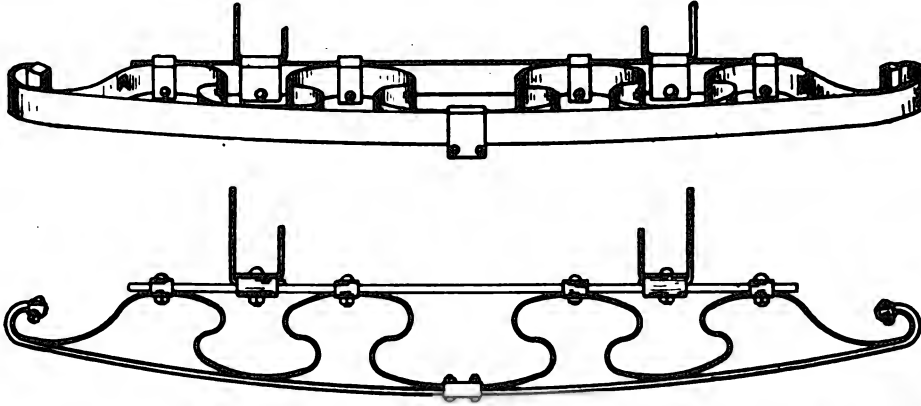
Made by A. R. Mosler & Company, New York City, N. Y.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

Protection Automobile Bumper is a new product. The design of bumper has a large amount of cushion area and the centrally located 'Hy-Lo' spring is placed in a floating position which allows it to equalize the impact at all times. This equalization condition is made possible by the spring member being anchored at the two extreme ends only and the mid-

by vibrations, it is stated.

By the use of the radius at the front of the bumper, this design will deflect a large portion of the impact while working in combination with the inner 'Hy-Lo' spring member. It is also stated that there is little or no chance of this bumper caving in at the middle section under a severe collision.



dle portion being held in position by a clamp which will slip to the required position when the bumper is under impact.

The centrally located 'Hy-Lo' spring only comes in contact with the outer spring member at three points which are held in position by steel bands while the other portion of the spring clears the contact by an air gap $\frac{3}{4}$ inches wide. This gap overcomes all metal chatter caused

The back spring steel portion of the bumper is anchored at the ends of the frame in a close coupled manner which overcomes a large per cent. of overhang, and, at the same time, this portion of the bumper protects the horns of the frame from being broken off under a heavy impact.

Manufactured by Protection Automobile Bumper Company, Grand Rapids, Mich.

Stay-hot Soldering Iron and Blow Torch is a new and very useful tool. It can be used to good advantage by garages, plumbers, electricians, repair shops, battery service stations and tinsmiths. It also can be used in the home, and the automobile owner will find it practically indispensable for it is, in reality, a handy tool for a handy man.



This torch, which burns denatured alcohol, does away with the necessity of carrying bulky fire-pots for the heating of irons. When in use as a soldering iron an even heat is maintained without interruption of changing irons and enables the performance of much more work in a given time with a cleaner, better grade of workmanship, it is claimed. Due to the fact that the rich blue flame only touches the back of the soldering tip, tinning lasts much longer than on the old type irons. By simply unscrewing the copper tip, the tool becomes a very efficient blow-torch, it is stated.

This appliance is made in two sizes and practically every branch of soldering work can be handled with it. It is claimed the model "A" will burn and maintain a uniform heat for thirty minutes on one filling at a cost of one cent,

and the model "B" will burn for over one hour at a cost of two cents.

These tools are made up in brass with stained wood handles and present a very attractive appearance. By removing the wood cap at large end of handle, a brass cap is exposed which is removed for filling purposes. When the wood cap is again in place a small amount of alcohol is placed in the priming cup above the wood handle for starting, which takes approximately two minutes to burn out and then the iron is ready for use.

Manufactured by Thermo Gas Products Company, 546 Atlantic Avenue, Brooklyn, N. Y.

M&K Water Pump is a device to keep the Ford motor at a constant temperature when operating. It is said to eliminate the possibility of overheating, steaming, boiling, freezing and the annoyances that inevitably follow these evils, which, in a great many instances, can be traced to improper functioning of the cooling system.



When an M&K water pump has been installed on the Ford engine, it is said to insure a positive and perfect circulation in the engine at all times and under all conditions of running. The impeller used in this device is so constructed that it furnishes a smooth, steady flow through the arteries of the engine and keeps the system clean and in perfect working condition.

This pump is said to provide a smoother running Ford engine in all weather by the maintaining of a constant working temperature and the preventing of pre-ignition.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

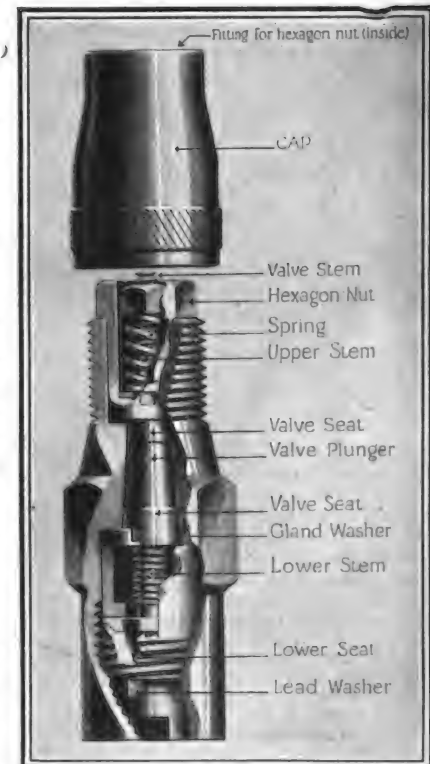
The manufacturer states that the device is easily installed in 15 minutes and does not require any extra parts. In order to install it is but necessary to remove the pipe with elbow between the radiator and motor, then install the pump in place of the pipe. Lower the fan arm as far as possible and place the new belt furnished with the pump over the pulleys. Take up the slack in the belt by readjusting the fan arm, ascertaining that the pulleys are in line. The pump is then ready to operate.

Manufactured by McDonald-Klein Company, 1604 Main Street, Buffalo, N. Y.

Trex Air Valve Lock has been invented to prevent tire valve leakage and end inflation troubles, it is stated.

This new lock replaces the ordinary rubber-seated air valve in the automobile tire and is attached by taking out the valve inside and screwing the new lock on to the valve stem securely. It is all metal and locks the air passage.

It is said with this valve lock there are no duties for the motorist to perform, and yet, through the constant pressure, it eliminates the cause of rim-cutting and



premature blowouts, and this adds to the life of the tire.

The manufacturer states the lock has no rubber parts to rot or deteriorate. It is all metal and designed to double-lock the air passage. It is said to be made with all the mechanical precision of a time-fuse and should outlast the life of the car itself. It is also claimed Trex Air Valve Lock reduces tire bills, saves valuable time and the nuisance of re-pumping. It fits any time and can be transferred from one tire to another, the same as a dust cap.

The Trex Lock is being marketed through established jobbers and dealers. Several national mediums and trade papers are being used as well as billboards, counter displays and other types of dealer helps.

Displayed in orange and black boxes, each containing five locks suitable for the four tires and spare tire on one motor car. Sold singly if you desire—only \$1.00 for each tire. Backed by a guarantee.

Manufactured by the Trexler Company, Philadelphia, Pa.

Lokwel Tilting and Locking Steering Wheel is said to improve the appearance of a car, make driving easier, affords a

ing position.

As an approved locking device the Lokwel meets all the requirements of insurance companies, it is stated, and at the same time gives the motorist a positive, handy locking mechanism which is as efficient as many on the market today.

A high grade tumbler lock is used. The motorist just snaps the trigger into place to secure car against theft. The use of a key is only necessary when the car is being unlocked. The lock is conveniently placed at top of steering post.

The wheel itself is of standard 17-inch diameter. The rim is made of seasoned maple, stained and highly polished. The spider is cast of aluminum in one piece and is highly burnished on both sides.

Lokwel steering wheels may be obtained in models to fit Ford, Overland, Dodge, Maxwell and Chevrolet cars.

Due to the simplicity of its design the steering wheel can be quickly and easily attached to the

steering post of the car for which it is made. The center head is made of case-hardened steel and is carefully machined. A deep key way insures positive and durable steering leverage while wheel is unlocked. But when the lock is snapped into place the Lokwel cannot again be engaged with the post until key is inserted and the mechanism unlocked.

Manufactured by the Rollaway Motor Company, Toledo, O.

securing device that is now in much demand and also makes it easy and convenient to enter and leave driver's seat. It also stays put until lowered into steer-

Gordon Motor Crib enables the motorist to get the greatest pleasure out of the automobile. The motor crib takes care of the baby in a satisfactory, easy, natural way. It is said thousands of families, for the past four years, have been keenly enjoying their drives while their babies sleep peacefully in the crib. The motion is so gentle that babies may travel long distances over any road without shocks or jars. The maker claims in no case has a baby ever fallen out or been subjected to any harmful influences.

The motor crib is adapted to any make car, from Ford to Locomobile. It does

ple to attach or detach. Two straps are provided which can be buckled to the robe rail or to the two strap loops that screw to the back of the front seat. On most cars it is better to use the loops as they can be attached in exactly the de-



not obstruct the entrance on either side, and leaves plenty of room for the passengers in the back seat. It is so neatly arranged, so compact in form that it absolutely does not touch the car in any way that could mar the finish. It is sim-

sired position. A short strap provided with ring attached should be screwed to the floor, foot rail or under back seat cushion in center of car. The spring snaps in this ring and you are ready for the baby. By loosening two thumb screws the

(When Writing to Advertisers, Please Mention the Automobile Journal.)

crib folds down flat against the back of seat; or can be taken out and used on the porch and put back in a few seconds. An ingenious spring and suspending arrangement counteracts the jolting of the machine. This spring is adjustable, therefore, the baby rides as smoothly as in a Pullman car.

The crib is made of black enameled steel frame, covered with glossy black leatherette, salmon colored inside, or khaki colored canvas. Inside dimensions, 32x14 inches; weight, 10 pounds; individually boxed, folded, with parts complete all ready to be attached in a few moments.

The price of the Gordon Motor Crib is \$10; west of Rockies, \$11. Each crib is fully guaranteed by the maker.

Manufactured by Gordon Motor Crib Company, 219 North State Street, Chicago.

Fairmount Valve Lifter is an accessory which greatly aids the repairman when working on an engine having poppet valves. It is very substantially made to withstand hard and constant usage.

The body of the tool is comprised of two drop forged levers, each one of which has a corrugated claw foot on one end, while on the other end it is riveted to the main forging. In this main forging a screw is



cut in which the screw of the handle rotates and applies the necessary leverage to the drop forged levers to enable them to overcome the resistance of the valve spring. The toggle joint is made of heavy stamped steel and securely riveted to the adjusting screw and each of the levers.

The tool is highly finished throughout its construction.

Made by the Fairmount Tool and Forging Company, Cleveland, O.

Hoerner Reamer Guide is claimed to overcome a difficulty which besets the operation of valve seat retooling, in an effective and simple manner. Usually the valve guide holes are badly worn and require reaming out to perfect roundness before refitting them with new valves having oversize stems.

The holes being worn to an irregular shape make it difficult to properly center the reamer, resulting in the rebored hole not being concentric with the valve seat.



This necessitates recutting the valve seat to bring it into line with the guide hole. That this difficulty is obviated by the Hoerner Reamer Guide, which fits inside of the valve port and supplies a true center hole through which the reamer may work is claimed by the manufacturer. It is made for all size valves, the price being for Fords and Chevrolet \$1.25 postpaid in U. S. and for all others \$2.

Made by the Hoerner Manufacturing Company, 3929 Moneta Avenue, Los Angeles, Cal.

Where "Orphans" May Be Equipped

List of Concerns Supplying Parts for Cars No Longer Being Built—Arranged Alphabetically According to Trade Names of Vehicles.

- ABBOTT.**
Puritan Machine Co., 422 Lafayette Boulevard, Detroit, Mich.
Saunders, Ernest W., 27 Stanhope St., Boston, Mass.
Standard Motor Parts Co., Detroit, Mich.
- ACME.**
Puritan Machine Co., Detroit, Mich., and New York City.
- ADAMS.**
Longaker Co., V. A., 448-50 N. Capitol Ave., Indianapolis, Ind.
- AEROCAR.**
Akeley-Steele Co., 79 Galena Blvd., Aurora, Ill.
Auto Gear Co., 844 8th Ave., N. Y. City.
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
- ALCO.**
Chandler, Ralph, J., 526 S. Flower St., Los Angeles, Cal.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- ALDEN-SAMPSON.**
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
Standard Motor Parts Co., New Castle, Ind.
- ALLIS-CHALMERS.**
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- ALMA.**
Dayton Auto Parts Co., 1777 Broadway, New York.
- ALPENA.**
Gorey & Co., Jos. C., 354 W. 50th St., N. Y. City.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- ALTER.**
American Motors Parts Co., 430 N. Capitol Ave., Indianapolis.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- AMERICAN.**
American Motors Parts Co., 430 N. Capitol Ave., Indianapolis.
Auto Gear Co., 844 8th Ave., N. Y. City.
Auto Parts & Gear Co., Atlanta, Ga.
Longaker Co., V., 448-50 N. Capitol Ave., Indianapolis.
Maxwell Bros. Auto Salvage Co., St. Louis, Mo.
Puritan Machine Co., Detroit, Mich., and N. Y. City.
- AMERICAN MORS.**
St. Louis Car Co., 8000 N. Broadway, St. Louis.
- AMERICAN TRUCK.**
Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.
- AMES.**
Auto Gear Co., 844 8th Ave., N. Y. City.
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
- AMPLEX.**
Gorey & Co., Jos. C., 354 W. 50th St., N. Y. City.
Maxwell Bros. Auto Salvage Co., St. Louis, Mo.
Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.
Puritan Machine Co., Detroit, Mich., and N. Y. City.
- ANCHOR.**
Anchor Motor Car Co., St. Louis, Mo.
- ANHUT.**
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- ARBENZ.**
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
- ARDSLEY.**
Ardsley Motor Car Co., Yonkers, N. Y.
- ARGO.**
Auto Gear & Parts Co., Atlanta, Ga.
Great Western Auto Co., Kalamazoo, Mich.
Maxwell Bros. Auto Salvage Co., St. Louis, Mo.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- ARGO ELECTRIC.**
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- ATLANTIC.**
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- ATLAS.**
Auto Gear Co., 844 8th Ave., N. Y. City.
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
Automobile Sales Co., Springfield, Mass.
Gorey & Co., Jos. C., 354 W. 50th St., N. Y. City.
Maxwell Bros. Auto Salvage Co., St. Louis, Mo.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- AUSTIN.**
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- AUTOCAR.**
Autocar Co., Ardmore, Pa.
- AUTOCRAT.**
Maxwell Bros. Auto Salvage Co., St. Louis, Mo.
- AVERY.**
Auto Parts Co., St. Louis, Mo.
- BABCOCK.**
Babcock Manufacturers' Supply Co., Waretown, N. Y.
Gorey & Co., Jos. C., 354 W. 50th St., N. Y. City.
Puritan Machine Co., Detroit, Mich., and N. Y. City.
- BADGER.**
Auto Gear Co., 844 8th Ave., N. Y. City.
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
Schultz & Harder, Columbus, Wis.
- BARNES.**
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- BAUER.**
Bauer Machine Co., 109 W. 18th St., Kansas City.
- BEAVER.**
Auto Parts Co., 4116 Olive St., St. Louis.
- BENHAM.**
Gorey & Co., Jos. C., 354 W. 50th St., N. Y. City.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- BENZ.**
Gorey & Co., Jos. C., 354 W. 50th St., N. Y. City.
- BERGDOLL.**
Auto Gear Co., 844 8th Ave., N. Y. City.
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
Auto Parts Co., 4116 Olive St., St. Louis.
Bergdoll Co., Louis J., Philadelphia, Pa.
Gorey & Co., Jos. C., 354 W. 50th St., N. Y. City.
Levene Motor Co., 2200-18 Diamond St., Philadelphia.
Maxwell Bros. Auto Salvage Co., St. Louis, Mo.
- BERKSHIRE.**
Auto Gear Co., 844 8th Ave., N. Y. City.
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- BERLIET.**
Puritan Machine Co., Detroit, Mich., and N. Y. City.
- BESSENER.**
Cutting Co., Robt. M., Chicago, Ill.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- BIMEL.**
American Motor Parts Co., 430 N. Capitol Ave., Indianapolis.
Puritan Machine Co., Detroit, Mich., and N. Y. City.
- BLACK CROW.**
Crow-Elkhart Motor Co., 1100 N. Main St., Elkhart, Ind.
- BLOMSTROM.**
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- BORLAND.**
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- BOURNE-MAGNETIC.**
Atlantic Refining Co., Philadelphia, Pa.
- BRIGGS-DETROITER.**
Levene Motor Co., 2200-18 Diamond St., Philadelphia.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- BRINTELL.**
Puritan Machine Co., Detroit, Mich., and N. Y. City.
- BROC ELECTRIC.**
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- BRODESSER.**
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- BROWN.**
Great Western Automobile Co., Kalamazoo.
- BROWNECAR.**
Hinsdale Electric Supply Co., Hinsdale, Mich.
- BRUSH.**
Barney's Auto Parts Co., 233 W. 50th St., N. Y. City.
Gorey & Co., Jos. C., 354 W. 50th St., N. Y. City.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
Southern Welding Co., Waco, Tex.
Standard Motor Parts Co., New Castle, Ind.
- BUFFALO ELECTRIC.**
Puritan Machine Co., Detroit, Mich., and N. Y. City.
- BURCH.**
Nebraska Iron & Metal Co., 123 Norfolk Ave., Norfolk, Neb.
- BURG.**
Wichita Auto Wrecking Co., 807 W. Douglas Ave., Wichita.
- BUSH.**
Victor Motor Co., York, Pa.
- CALIFORNIA.**
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- CAMERON.**
Cameron Motors Corp., 2 Columbus Circle, N. Y. City.
- CARHARTT.**
Auto Gear Co., 844 8th Ave., N. Y. City.
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
Gorey & Co., Jos. C., 354 W. 50th St., N. Y. City.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- CAR-NATION.**
Auto Gear Co., 844 8th Ave., N. Y. City.
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
Standard Motor Parts Co., Detroit.
- CARTERCAR.**
Auto Parts Co., St. Louis, Mo.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
Southern Welding Co., Waco, Tex.
- CARTHAGE.**
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- CAVAC.**
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- CENTURY.**
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- CHADWICK.**
Chadwick Engineering Works, Pottstown, Pa.
- CHASE.**
Auto Parts Co., 4116-18 Olive St., St. Louis.
- CINCO.**
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

CINO.

Puritan Machine Co., Detroit, Mich., and N. Y. City.
Queen City Auto Parts Co., 633 Main St., Cincinnati.

CLARK.

Clark Motor Car Co., Shelbyville, Ind.
Puritan Machine Co., 423 Lafayette Boulevard, Detroit.

CLARK-CARTER.

Cutting Co., Robt. M., Chicago, Ill.
Erbes, L. C., 2654 W. University Ave., St. Paul.
Puritan Machine Co., 423 Lafayette Boulevard, Detroit.

CLEVELAND.

Garford Motor Truck Co., Lima, O.
Pacific Motor Car Exchange, 221 W. 53rd St., N. Y. City.

COATES-GOSHEN.

Coates-Goshen Auto Co., Goshen, N. Y.
Gorey & Co., Jos. C., 354 W. 50th St., N. Y. City.
Miller Car Co., Goshen, N. Y.

COLBURN.

Colburn Automobile Co., 416 E. 10th Avenue, Denver.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

COLBY.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

COLUMBIA (Old).

Columbia Auto Repair Co., 19 Buckingham St., Hartford.
Puritan Machine Co., Detroit, Mich., and N. Y. City.

Standard Motor Parts Co., New Castle, Ind.

COLUMBIA KNIGHT.

Columbia Auto Repair Co., Hartford.
Standard Motor Parts Co., New Castle, Ind.

COLUMBUS.

Genesee Auto Wrecking Co., 430 Genesee St., Buffalo, N. Y.

COLUMBUS ELECTRIC.

New Columbus Buggy Co., Columbus, O.

COLUMBUS GASOLINE.

Columbus Buggy Parts Co., Columbus, O.

CONNERSVILLE.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

CONTINENTAL.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

Wyckoff Auto Salvage Co., Sioux City, Ia.

CORBIN.

Corbin Motor Vehicle Co., New Britain, Conn.

CORBETT.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

CORREJA.

Auto Gear Co., 844 8th Ave., N. Y. City.

Auto Gear & Parts Co., Atlanta, Ga.

Gorey & Co., Jos. C., 354 W. 50th St., N. Y. City.

Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.

Saunders, Ernest W., 27 Stanhope St., Boston, Mass.

COURIER.

Akeley-Steele Co., 70 Galena Blvd., Aurora, Ill.

Auto Gear Co., 844 8th Ave., N. Y. City.

Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.

Genesee Auto Wrecking Co., 430 Genesee St., Buffalo, N. Y.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

Saunders, Ernest W., 27 Stanhope St., Boston, Mass.

Southern Welding Co., Waco, Tex.

Standard Motor Parts Co., Detroit, Mich.

Wyckoff Auto Salvage Co., Sioux City, Ia.

COURIER-CLERMONT.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

Standard Motor Parts Co., New Castle, Ind.

COURIER-GLIDE.

Maxwell Bros. Auto Salvage Co., St. Louis, Mo.

CRAIG-TOLEDO.

Colter, A. W., Toledo, O.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

CRESCENT.

Auto Gear Co., 844 8th Ave., N. Y. City.

Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

CRICKET.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

CROW.

Auto Gear Co., 844 8th Ave., N. Y. City.

Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.

Crow-Elkhart Motor Co., 1116 N. Main St., Elkhart, Ind.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

CROXTON.

Auto Gear & Parts Co., Atlanta, Ga.

Puritan Machine Co., 423 Lafayette Boulevard, Detroit.

CROXTON-KEETON.

Auto Gear Co., 844 8th Ave., N. Y. City.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

CUTTING.

Auto Gear Co., 844 8th Ave., N. Y. City.

Auto Gear & Parts Co., Atlanta, Ga.

Erbes, L. C., 2654 W. University Ave., St. Paul, Minn.

Genesee Auto Wrecking Co., 430 Genesee St., Buffalo, N. Y.

Harris Bros. Co., Chicago, Ill.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

Wolf Auto Parts & Tire Co., 619 N. Illinois St., Indianapolis, Ind.

Wyckoff Auto Salvage Co., Sioux City, Ia.

DART.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

DAVIS.

Dayton Auto Parts Co., 351-55 West 52nd St., N. Y. City.

DAYTON.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

DEARBORN-DETROIT.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

DECAUVILLE.

Gorey & Co., Jos. C., 354 W. 50th St., N. Y. City.

DEERE-CLARKE.

Levene Motor Co., Philadelphia, Pa.

DE KALB.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

DE LUXE.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

DE MOT.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

DESCHAUM.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

DE SOTA.

Zimmerman Mfg. Co., Auburn, Ind.

DE TAMBLE.

American Motors Parts Co., 430 N. Capitol Ave., Indianapolis.

Auto Gear Co., 844 8th Ave., N. Y. City.

Auto Gear & Parts Co., Atlanta, Ga.

De Tumble Motors Co., Indianapolis, Ind.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

DETROIT-CHATUM.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

DETROITER.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

Saunders, Ernest W., 27 Stanhope St., Boston, Mass.

Standard Motor Parts Co., Newcastle, Ind.

DOYSON.

Auto Gear Co., 844 8th Ave., N. Y. City.

Auto Gear & Parts Co., Atlanta, Ga.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

DRAGON.

Philadelphia Machine Works, 61-71 Laurel St., Philadelphia.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

DREXEL.

Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.

DRUMMOND.

Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.

DUER.

Chicago Coach & Carriage Co., Chicago, Ill.

DUPONT.

Victor Motor Co., York, Pa.

DUROCAR.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

ECLIPSE.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

Toepfer's Sons, Frank, Milwaukee, Wis.

ECONOMY.

Auto Salvage Co., Inc., Kansas City, Mo.

EDWARD-KNIGHT.

Dayton Auto Parts Co., 1777 Broadway, New York.

Willys-Overland, Inc., Toledo.

EDWARDS.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

ELCO.

American Motor Parts Co., Indianapolis, Ind.

ELK.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

ELMORE.

Auto Gear Co., 844 8th Ave., N. Y. City.

Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.

Gorey & Co., Jos. C., 354 W. 50th St., New York.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

E. M. F.

Studebaker Corp. of America, Piquette Ave. and Brush St., Detroit.

E-M-F THIRTY.

Carey & Davis, 486 Louisiana Ave., Washington, D. C.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

EMPIRE.

Auto Parts So., St. Louis, Mo.

Empire Automobile Co., Indianapolis, Ind.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

York Motor Car Co., York, Pa.

ENGEL.

American Motors Parts Co., 430 N. Capitol Ave., Indianapolis.

Auto Gear Co., 844 8th Ave., N. Y. City.

Auto Parts Co., St. Louis, Mo.

Erbes, L. E., Motor Car Co., 2654 W. University Ave., St. Paul.

Saunders, Ernest W., 27 Stanhope St., Boston, Mass.

EVERITT.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

Saunders, Ernest W., 27 Stanhope St., Boston, Mass.

Standard Motor Parts Co., New Castle, Ind.

EWING.

Gorey & Co., Jos. C., 354 W. 50th St., New York.

Pacific Motor Car Exchange Co., 221 W. 23rd St., N. Y. City.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

F. A. L.

Auto Gear Co., 844 8th Ave., N. Y. City.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

FALCAR.

Wichita Auto Wrecking Co., 807 W. Douglas Ave., Wichita.

FARNACK.

Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.

FAWICK.

Waukesha Motor Co., Waukesha, Wis.

FIRESTONE COLUMBUS.

Auto Gear Co., 844 8th Ave., N. Y. City.

Auto Gear & Parts Co., Atlanta, Ga.

New Columbus Buggy Co., Columbus, O.

FLANDERS.

Studebaker Corp. of America, Piquette Ave. and Brush St., Detroit.

FLANDERS ELECTRIC.

Levene Motor Co., 2200-18 Diamond St., Philadelphia.

FULLER.

Jackson Motors Corp., Jackson, Mich.

GAETH.

Gaeth Motor Car Co., 2103 Lorain Ave., Cleveland.

GARFORD.

Auto Parts Co., 4116-18 Olive St., St. Louis.

Garford Motor Truck Co., Lima, O.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

GENEVA TRUCK.

Geneva Wagon Co., Geneva, N. Y.

G-J-G.

Gorey & Co., Jos. C., 354 W. 50th St., N. Y. C.

Pacific Motor Car Exchange Co., 221 W. 23rd St., N. Y. C.
Puritan Machine Co., Detroit, Mich., and N. Y. C.

GLEASON.

Bauer Machine Works Co., 109 W. 18th St., Kansas City.

GLIDE,

Auto Parts Co., St. Louis, Mo.
Avery Co., Peoria, Ill.

GRABOWSKY.

Gorey & Co., Jos. C., 354 W. 50th St., New York.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

GRAMM.

Garford Motor Truck Co., Lima, O.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

GRAMM-LOGAN.

Garford Motor Truck Co., Wapaka Road, Lima, O.

GREAT EAGLE.

Auto Salvage Co., 1701-03 Main St., Kansas City.

GREAT SMITH.

Bauer Machine Works, Kansas City, Mo.

GREAT WESTERN.

Auto Gear Co., 844 8th Ave., N. Y. C.
Auto Gear & Parts Co., Atlanta, Ga.
Great Western Automobile Co., Kalamazoo, Mich.
Maxwell Bros. Auto Salvage Co., St. Louis, Mo.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

GREEN DRAGON.

Auto Salvage Co., Inc., Kansas City, Mo.

GROUT.

Puritan Machine Co., Detroit, Mich., and N. Y. City.
Red Arrow Auto Co., E. River St., Orange, Mass.

HALL.

Standard Motor Parts Co., Detroit, Mich.

HALLIDAY.

Auto Gear & Parts Co., Atlanta, Ga.
Maxwell Bros. Auto Salvage Co., St. Louis, Mo.

HART-KRAFT.

Petrie & Morgenthall, Greencastle, Pa.

HASSLER.

Hassler Motor Car Co., Indianapolis, Ind.

HATFIELD.

Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.

HAVERS.

Auto Gear Co., 844 8th Ave., N. Y. City.
Gorey & Co., Jos. C., 354 W. 50th St., New York.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

HAZARD.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

HENDERSON.

Auto Gear Co., 844 8th Ave., N. Y. City.
Auto Gear & Parts Co., Atlanta, Ga.
Buda Co., Harvey, Ill.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

Standards Motor Parts Co., Detroit, Mich.

HENRY.

Auto Gear Co., 844 8th Ave., N. Y. City.
Auto Gear & Parts Co., Atlanta, Ga.
Gorey & Co., Jos. C., 354 W. 50th St., N. Y.

Muskegon Auto Co., Muskegon, Mich.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

HERFF-BROOKS.

Holzappel & Son, Henry, Richmond, Ind.

HERSHOFF.

American Motors Parts Co., 430 N. Capitol Ave., Indianapolis.

Gorey & Co., Jos. C., 354 W. 50th St., New York.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

HEWITT.

International Motor Co., 64th St. & West End Ave., New York.

HOUTT ROCKWELL.

New Departure Mfg. Co., Bristol, Conn.

HUBSON FRANKLIN.

Boston Auto Parts Co., 1221 Dorchester Ave., Boston.

IMPERIAL.

Auto Gear Co., 844 8th Ave., N. Y. City.
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.

Mutual Motors Co., N. Townawanda, N. Y.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

vard, Detroit.

Standard Motor Parts Co., Detroit.

INDIANA.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

INTERSTATE.

Nebraska Iron & Metal Co., 122 Norfolk Ave., Norfolk, Neb.

JACKSON.

Auto Salvage Co., 1701-03 Main St., Kansas City.

Jackson Automobile Co., Jackson, Mich.

JEFFERY.

Mid-West Auto Parts Co., 1318 W. Broadway, Council Bluffs, Ia.

JENKINS.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

JOHNSON.

Johnson Service Co., Milwaukee, Wis.

KEETON.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

Standard Motor Parts Co., Detroit.

KELSEY.

Kelsey Motor Co., Hartford, Conn.

KERMATH.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

KERNET.

Keith Bros., Elkhart, Ind.

Knox Motor Co., 53 W. W. Abraham Rd., Springfield, Mass.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

KNOX.

Knox Motors Co., Springfield, Mass.

KOMET.

Keith Bros., Elkhart, Ind.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

KRALL.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

KREBS.

Dayton Auto Parts Co., 1777 Broadway, New York.

KRIT.

Auto Gear & Parts Co., Atlanta, Ga.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

Standard Motor Parts Co., Detroit.

LAMBERT.

American Motors Parts Co., Indianapolis, Ind.

Auto Parts Co., St. Louis, Mo.

LANE TRUCK.

Kalamazoo Motors Corp., Kalamazoo, Mich.

LANDSEN-ELECTRIC.

Kelland Motor Car Co., 58 Elm St., Newark, N. J.

LENOX.

Auto Gear & Parts Co., Atlanta, Ga.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

LEWIS.

American Motor Parts Co., Indianapolis, Ind.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

LINCOLN TRUCK.

Hannon, J. E., 24 Mass. Ave., Detroit, Mich.

LION.

Lion Motor Parts Co., Philadelphia.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

LITTLE-FOUR.

Auto Gear & Parts Co., Atlanta, Ga.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

LITTLE SIX.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

LOGAN.

Garford Motor Truck Co., Lima, O.

Gramm Motor Truck Co., Lima, O.

LONGEST.

Longest Bros. Co., 725-29 S 3rd St., Louisville, Ky.

LOZIER.

Lozier Motor Car Co., Fort and Sixth Sts., Detroit, Mich.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

L. P. C.

American Motor Parts Co., Indianapolis, Ind.

LUVERNE (1912).

Auto Gear Co., 844 8th Ave., N. Y. City.

Auto Gear & Parts Co., Atlanta, Ga.

LYONS-KNIGHT.

Wolf Auto Parts & Tire Co., 619 N. Illinois St., Indianapolis, Ind.

MCINTYRE.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

MAIS TRUCK.

American Motor Parts Co., Indianapolis, Ind.

MARATHON.

Auto Gear Co., 844 8th Ave., N. Y. City.
Genesee Auto Wrecking Co., 430 Genesee St., Buffalo, N. Y.

Marathon Service Co., 14th & Clinton Sts., Nashville, Tenn.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

Saunders, Ernest W., 27 Stanhope St., Boston, Mass.

MARION.

American Motors Parts Co., 430 N. Capitol Ave., Indianapolis.

Auto Gears & Parts Co., Atlanta, Ga.

Gorey & Co., Jos. C., 354 W. 50th St., New York.

Longaker Co., V. A., 448-50 N. Capitol Ave., Indianapolis.

Mutual Motors Co., N. Townawanda, N. Y.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

Stutz Motor Car Co., 2450 Michigan Ave., Chicago, Ill.

MARION-HANDLEY.

Gorey & Co., Jos. C., 354 W. 50th St., N. Y. City.

Mutual Motors Co., N. Townawanda, N. Y.

MARQUETTE.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

MARRON.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

MARVEL.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

MASON.

Erbes, L. C., 2654 W. University Ave., St. Paul, Minn.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

Saunders, Ernest W., 27 Stanhope St., Boston, Mass.

Standard Motor Parts Co., Detroit.

MATHER.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

MATHESON.

Matheson Co., Frank F., 694 Wyoming Ave., Wilkes-Barre, Pa.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

MAXWELL (OLD).

Akeley-Steele Co., 79 Galena Blvd., Aurora, Ill.

Auto Gear Co., 844 8th Ave., N. Y. City.

Auto Gear & Parts Co., Atlanta, Ga.

Auto Tire & Parts Co., Cape Girardeau, Mo.

Genesee Auto Wrecking Co., 430 Genesee St., Buffalo, N. Y.

Mid-West Auto Parts Co., 1318 W. Broadway, Council Bluffs, Ia.

Nebraska Iron & Metal Co., 122 Norfolk Ave., Norfolk, Neb.

Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

Saunders, Ernest W., 27 Stanhope St., Boston, Mass.

Standard Motor Parts Co., Newcastle, Ind.

MAXWELL-BRISCOE.

Akeley-Steele Co., 79 Galena Blvd., Aurora, Ill.

Mid-West Auto Parts Co., 1318 W. Broadway, Council Bluffs, Ia.

Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.

Standard Motor Parts Co., Newcastle, Ind.

MAYTAG.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

Standard Motor Parts Co., Detroit, Mich.

MERCEDES.

Connecticut Auto Parts Co., 583 Franklin Ave., Hartford, Conn.

MERCHANT.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

METEOR.

Auto Gear Co., 844 8th Ave., N. Y. City.

Auto Gear & Parts Co., Atlanta, Ga.

Puritan Machine Co., Detroit, Mich., and N. Y. City.
Saunders, Ernest W., 27 Stanhope St., Boston, Mass.

METZGER.

Puritan Machine Co., Detroit Mich., and N. Y. City.
Standard Motor Parts Co., Detroit, Mich.

MICHIGAN.

Auto Gear Co., 844 8th Ave., N. Y. City.
Auto Gear & Parts Co., Atlanta, Ga.
Dauch Mfg. Co., 303 W. Water St., Sandusky, O.
Gorey & Co., Jos. C., 354 W. 50th St., N. Y. City.
Philadelphia Machine Works, 61-71 Laurel St., Philadelphia.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
Standard Motor Parts Co., Detroit, Mich.

MIDDLEBY.

Goldberg, H., 1420 S. 8th St., Philadelphia, Pa.
Levengood, A. J., 153 N. 4th St., Reading, Pa.
Puritan Machine Co., Detroit Mich., and N. Y. City.

MIDLAND.

Auto Gear Co., 844 8th Ave., N. Y. City.
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
Bergdoll Co., Louis J., Philadelphia, Pa.
Levene Motor Co., 2200-18 Diamond St., Philadelphia.
Lion Motor Parts Co., Philadelphia, Pa.
Maxwell Bros. Auto Salvage Co., St. Louis, Mo.
Midland Motor Co., Philadelphia, Pa.
Nebraska Iron & Metal Co., 122 Norfolk Ave., Norfolk, Neb.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

MIDLAND TRUCK.

Midland Motor Car & Truck Co., Box 152, Oklahoma City, Okla.

MIER.

Mier Carriage & Buggy Co., Ligonier, Ind.
MILLER.
Auto Gear & Parts Co., Atlanta, Ga.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

MILWAUKEE.

Erbes, L. C., 2654 W. University Ave., St. Paul, Minn.
Harris Bros. Co., Chicago, Ill.

MOGUL.

Auto Salvage Co., 1701-03 Main St., Kansas City.

MOLINE.

Auto Parts Co., 4116-18 Olive St., St. Louis.

MONARCH.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

MOORE.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

MORA.

Gorey & Co., Jos. C., 354 W. 50th St., N. Y. City.
Philadelphia Machine Works, 61-71 Laurel St., Philadelphia.

MORGAN.

Steele, W. M., 98-100 Beacon St., Worcester, Mass.

MOYER.

Auto Gear Co., 844 8th Ave., N. Y. City.
Auto Gear & Parts Co., Atlanta, Ga.
Puritan Machine Co., Detroit, Mich., and N. Y. City.

NANCE.

Gorey & Co., Jos. C., 354 W. 50th St., New York.

NIAGARA.

Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.

NORTHERN.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

NORTHWESTERN.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

NYBERG.

Auto Gear & Parts Co., Atlanta, Ga.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

OHIO.

Auto Gear Co., 844 8th Ave., N. Y. City.
Auto Gear & Parts Co., Atlanta, Ga.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
Wyckoff Auto Salvage Co., Sioux City, Ia.

OLIVER.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

OMAHA.

Auto Gear & Parts Co., Atlanta, Ga.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

ORIENT.

Metz-Friction Service, Waltham, Mass.

ORSON.

Pacific Motor Car Exchange Co., 221 W. 23rd St., N. Y. City.

OSWALD.

Auto Salvage Co., Inc., Kansas City, Mo.

OTTO.

Jones, Mark W., 53rd and Lansdowne Ave., Philadelphia, Pa.

OWEN.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

PACKERS.

Pacific Motor Car Exchange Co., 221 W. 23rd St., N. Y. City.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

PAIGE (THREE-CYLINDER.)

Auto Tire & Parts Co., Cape Girardeau, Mo.
Puritan Machine Co., Detroit, Mich., and N. Y. City.

PALMER-MOORE.

Moffitt's Sons, B. O., Binghamton, N. Y.

PALMER-SINGER.

Auto Gear & Parts Co., Atlanta, Ga.
Gorey & Co., Jos. C., 354 W. 50th St., N. Y. City.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

Singer Motor Co., 102-04 West End Ave., New York.

PANHARD.

Babel, L., 371 E. 29th St., Chicago, Ill.
Pacific Motor Car Exchange Co., 221 W. 23rd St., N. Y. City.

PARRY.

Auto Gear Co., 844 8th Ave., N. Y. City.
Auto Gear & Parts Co., Atlanta, Ga.
Auto Parts Co., 4116-18 Olive St., St. Louis.
Pathfinder Co., Indianapolis.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
Southern Welding Co., Waco, Tex.

PARTIN-PALMER.

Auto Tire & Parts Co., Cape Girardeau, Mo.
Commonwealth Motors Co., 326 W. Madison St., Chicago, Ill.
Saunders, Ernest W., 27 Stanhope St., Boston, Mass.

PATHFINDER.

American Motors Parts Co., 430 N. Capitol Ave., Indianapolis.
Mid-West Auto Parts Co., 1318 W. Broadway, Council Bluffs, Ia.
Pathfinder Co., The, Indianapolis, Ind.

PAULDING.

Anchor Motor Car Co., St. Louis, Mo.

PEABODY.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

PENN.

Auto Gear Co., 844 8th Ave., N. Y. City.
Auto Gear & Parts Co., Atlanta, Ga.
Buda Co., Harvey, Ill.
Pacific Motor Car Exchange Co., 221 W. 23rd St., N. Y. City.
Puritan Machine Co., Detroit, Mich., and N. Y. City.

PENNSYLVANIA.

Pacific Motor Car Exchange Co., 221 W. 23rd St., N. Y. City.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

PENN-THIRTY.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

PERU.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

PETREL.

Council Bluffs Auto Parts Co., Council Bluffs, Ia.

Filer & Stowell, Milwaukee.

PIERCE-RACINE.

Case Threshing Machine Co., J. I., Racine, Wis.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

POPE-HARTFORD.

Council Bluffs Auto Parts Co., Council Bluffs, Ia.

Genesee Auto Wrecking Co., 430 Genesee St., Buffalo, N. Y.

Hartford Motor Car Co., 410 Main St., Hartford, Conn.

Maxwell Bros. Auto Salvage Co., St. Louis, Mo.

Pacific Motor Car Exchange Co., 221 W. 23rd St., N. Y. City.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

Rosenfeld, J., 521 Sixth St. (S. Boston), Boston.

Saunders, Ernest W., 27 Stanhope St., Boston, Mass.

Walker & Barkman Mfg. Co., Hartford.

POPE-TOLEDO.

Maxwell Bros. Auto Salvage Co., St. Louis, Mo.

Pacific Motor Car Exchange Co., 221 W. 23rd St., N. Y. City.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

POPE-TRIBUNE.

Hartford Motor Car Co., 410 Main St., Hartford, Conn.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

POSS.

Auto Parts Co., St. Louis, Mo.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

PRATT-ELKHART.

Elkhart Carriage & Motor Car Co., Elkhart, Ind.

PULLMAN.

Auto Parts Co., St. Louis, Mo.

Auto Tire & Parts Co., Cape Girardeau, Mo.

Bergdoll Co., Louis J., Philadelphia, Pa.

Genesee Auto Wrecking Co., 430 Genesee St., Buffalo, N. Y.

Levene Motor Co., 2200-18 Diamond St., Philadelphia.

Lion Motor Parts Co., Philadelphia, Pa.

Midland Motor Co., Philadelphia, Pa.

Mid-West Auto Parts Co., 1318 W. Broadway, Council Bluffs, Ia.

Pullman Motor Car Co., York, Pa.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

Saunders, Ernest W., 27 Stanhope St., Boston, Mass.

York Motor Car Co., York, Pa.

PUNGS-FINCH.

Pungs-Finch Auto & Gas Engine Co., Detroit, Mich.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

QUEEN.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

RAINIER.

Garford Motor Truck Co., Wapaka Road, Lima, O.

Pacific Motor Car Exchange Co., 221 W. 23rd St., N. Y. City.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

RAMBLER.

Akeley-Steele Co., 79 Galena Blvd., Aurora, Ill.

Auto Parts Co., St. Louis, Mo.

Council Bluffs Auto Parts Co., Council Bluffs, Ia.

Maxwell Bros. Auto Salvage Co., St. Louis, Mo.

Mid-West Auto Parts Co., 1318 W. Broadway, Council Bluffs, Ia.

Wolf Auto Parts & Tire Co., 619 N. Illinois St., Indianapolis, Ind.

Wyckoff Auto Salvage Co., Sioux City, Ia.

RANDOLPH.

DeKalb Wagon Co., DeKalb, Ill.

Puritan Machine Co., 422 Lafayette Boulevard, Detroit.

Randolph Motor Truck Co., Flint, Mich.

RAPID.

Puritan Machine Co., Detroit, Mich., and N. Y. City.

RAYFIELD.

Auto Parts Co., 4116-18 Olive St., St. Louis.

R. C. H.

Auto Gear Co., 844 8th Ave., N. Y. City.

Auto Parts Co., St. Louis, Mo.

Gorey & Co., Jos. C., 354 W. 50th St., N. Y. City.

Mid-West Auto Parts Co., 1318 W. Broadway, Council Bluffs, Ia.

Pacific Motor Car Exchange Co., 221 W. 23rd St., N. Y. City.

Philadelphia Machine Works, Philadelphia, Pa.

- Puritan Machine Co., Detroit, Mich., and N. Y. City.
R. C. H. Corp., Detroit, Mich.
Saunders, Ernest W., 27 Stanhope St., Boston, Mass.
Wolf Auto Parts & Tire Co., 619 N. Illinois St., Indianapolis, Ind.
- READING.**
Goldberg, H., 1420 S. 8th St., Philadelphia, Pa.
Puritan Machine Co., Detroit, Mich., and N. Y. City.
- REED.**
Puritan Machine Co., Detroit, Mich., and N. Y. City.
- REGAL.**
Auto Parts Co., St. Louis, Mo.
Genesee Auto Wrecking Co., 430 Genesee St., Buffalo, N. Y.
Levine Motor Co., 2200-18 Diamond St., Philadelphia.
Mid-West Auto Parts Co., 1315 W. Broadway, Council Bluffs, Ia.
Puritan Machine Co., Detroit, Mich., and N. Y. City.
Saunders, Ernest W., 27 Stanhope St., Boston, Mass.
- RELIABLE-DAYTON.**
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- RELIANCE.**
Puritan Machine Co., Detroit, Mich., and N. Y. City.
- REPUBLIC.**
Auto Gear Co., 844 8th Ave., N. Y. City.
Republic Motor Car Co., Youngstown, O.
- RICHMOND.**
Mid-West Auto Parts Co., 1315 W. Broadway, Council Bluffs, Ia.
- RIDER-LEWIS.**
Longaker Co., V. A., 448-50 N. Capitol Ave., Indianapolis.
Puritan Machine Co., Detroit, Mich., and N. Y. City.
- ROSS.**
Great Western Auto Co., Kalamazoo, Mich.
- ROYAL TOURIST.**
Auto Parts Co., 4116-18 Olive St., St. Louis.
Puritan Machine Co., Detroit, Mich., and N. Y. City.
Royal Tourist Co., 72nd St. and St. Clair Ave., Cleveland, O.
- RUSH.**
Levene Motor Co., 2200-18 Diamond St., Philadelphia.
- RUSSELL.**
Auto Gear Co., 844 8th Ave., N. Y. City.
Auto Gear & Parts Co., Atlanta, Ga.
- SAMPSON.**
Auto Gear & Parts Co., Atlanta, Ga.
Puritan Machine Co., Detroit, Mich., and N. Y. City.
Saunders, Ernest W., 27 Stanhope St., Boston, Mass.
Standard Motor Parts Co., New Castle, Ind.
- SAMSON.**
Auto Gear Co., 844 8th Ave., N. Y. City.
- SANDUSKY.**
Dauch Mfg. Co., Sandusky, O.
- SAVOY.**
Barney's Auto Parts Co., 233 W. 50th St., N. Y. City.
Saunders, Ernest W., 27 Stanhope St., Boston, Mass.
- SAYBROOK.**
Barney's Auto Parts Co., 233 W. 50th St., N. Y. City.
Saunders, Ernest W., 27 Stanhope St., Boston, Mass.
- SCHACHT.**
Auto Gear Co., 844 8th Ave., N. Y. City.
Auto Gear & Parts Co., Atlanta, Ga.
Genesee Auto Wrecking Co., 430 Genesee St., Buffalo, N. Y.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
Schacht Motor Truck Co., G. A., Cincinnati, O.
- SCRIPPS-BOOTH CYCLE CAR.**
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- SELDEN.**
Auto Gear Co., 844 8th Ave., N. Y. City.
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
Genesee Auto Wrecking Co., 430 Genesee St., Buffalo, N. Y.
Gorey & Co., Jos. C., 354 W. 50th St., N. Y. City.
Maxwell Bros. Auto Salvage Co., St. Louis, Mo.
- Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- S. G. V.**
Pacific Motor Car Exchange Co., 221 W. 53rd St., N. Y. City.
Puritan Machine Co., Detroit, Mich., and N. Y. City.
- SILENT-KNIGHT.**
Wolf Auto Parts & Tire Co., 619 N. Illinois St., Indianapolis, Ind.
- SOUTHERN.**
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
Southern Auto & Equipment Co., Atlanta, Ga.
- SPAULDING.**
Puritan Machine Co., Detroit, Mich., and N. Y. City.
- SPEEDWELL.**
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- SPHINX.**
Auto Gear Co., 844 8th Ave., N. Y. City.
Auto Gear & Parts Co., Atlanta, Ga.
York Motor Car Co., York, Pa.
- SPRINGFIELD.**
Haas Electric & Mfg. Co., 305-07 E. Monroe St., Springfield, Ill.
- STAFFORD.**
Auto Salvage Co., 1701-03 Main St., Kansas City.
- STANDARD.**
St. Louis Car Co., 5200 N. Second St., St. Louis.
- STANDARD SIX.**
Auto Gear Co., 844 8th Ave., N. Y. City.
Auto Gear & Parts Co., Atlanta, Ga.
Puritan Machine Co., Detroit, Mich., and N. Y. City.
St. Louis Car Co., 8000 N. Broadway, St. Louis.
- STAR.**
Mier Carriage & Buggy Co., Ligonier, Ind.
Puritan Machine Co., Detroit, Mich., and N. Y. City.
- STAVER.**
Auto Gear Co., 844 8th Ave., N. Y. City.
Auto Gear & Parts Co., Atlanta, Ga.
Auto Parts Co., St. Louis, Mo.
Puritan Machine Co., Detroit, Mich., and N. Y. City.
Staver Co., 106 W. 55th St., Chicago, Ill.
- STEARNS-KNIGHT.**
Maxwell Bros. Auto Salvage Co., St. Louis, Mo.
- STERLING.**
Keith Bros., Elkhart, Ind.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- STEVENS-DURYEA.**
Mid-West Auto Parts Co., 1315 W. Broadway, Council Bluffs, Ia.
Puritan Machine Co., Detroit, Mich., and N. Y. City.
Stevens-Duryea Co., Chicopee Falls, Mass.
Stevens-Duryea Co., 72 12th St., San Francisco, Cal.
Stevens-Duryea Service, Inc., 219 E. 67th St., N. Y. City.
- STODDARD-DAYTON.**
Auto Gear & Parts Co., Atlanta, Ga.
Barney's Auto Parts Co., 233 W. 50th St., N. Y. City.
Puritan Machine Co., Detroit, Mich., and N. Y. City.
Standard Motor Parts Co., New Castle, Ind.
- STRATFORD.**
Barney's Auto Parts Co., 233 W. 50th St., N. Y. City.
Saunders, Ernest W., 27 Stanhope St., Boston, Mass.
- SUBURBAN.**
Auto Gear Co., 844 8th Ave., N. Y. City.
Auto Gear & Parts Co., Atlanta, Ga.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- SULTAN.**
Gorey & Co., Jos. C., 354 W. 50th St., N. Y. City.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- SUN.**
Automotive Corp., Toledo, O.
- THOMAS.**
Auto Gear Co., 844 8th Ave., N. Y. City.
Auto Gear & Parts Co., Atlanta, Ga.
Maxwell Bros. Auto Salvage Co., St. Louis, Mo.
- Puritan Machine Co., Detroit, Mich., and N. Y. City.
Southern Welding Co., Waco, Tex.
Thomas Motor Car Co., E. R., Buffalo, N. Y.
- THOMAS-DETROIT.**
Puritan Machine Co., Detroit, Mich., and N. Y. City.
- TINCHER.**
Chicago Coach & Carriage Co., Chicago, Ill.
- TOLEDO.**
Dayton Auto Parts Co., 1777 Broadway, New York.
- TOURAIN.**
Gorey & Co., Jos. C., 354 W. 50th St., New York.
- TOURIST.**
Burt Motor Car Co., W. J., Pico & Hope Sts., Los Angeles.
Puritan Machine Co., Detroit, Mich., and N. Y. City.
- TRAVELER.**
Single Center Buggy Co., Fifth & Locust Sts., Evansville, Ind.
- TRUMBULL.**
Levene Motor Co., 2200-18 Diamond St., Philadelphia.
- TWOMBLY.**
Driggs-Seabury Ordnance Co., Sharon, Pa.
Puritan Machine Co., Detroit, Mich., and N. Y. City.
- VAN DYKE.**
Puritan Machine Co., Detroit, Mich., and N. Y. City.
- VICTOR.**
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
- VIRGINIAN.**
Auto Gear Co., 844 8th Ave., N. Y. City.
Auto Gear & Parts Co., Atlanta, Ga.
- VULCAN.**
Savage Arms Corp., Sharon, Pa.
- WACO.**
Grant Machine Works, 5401 33rd Ave., S., Seattle, Wash.
- WAGENHALL.**
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
Riverside Machinery Depot, Detroit, Mich.
- WAHL.**
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- WALTERS.**
Auto Gear Co., 844 8th Ave., N. Y. City.
Auto Gear & Parts Co., Atlanta, Ga.
- WALTHAM-ORIENT.**
Metz-Friction Service, Waltham, Mass.
- WARREN.**
Auto Gear & Parts Co., Atlanta, Ga.
Gorey & Co., Jos. C., 354 W. 50th St., New York.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- WASHINGTON.**
Puritan Machine Co., Detroit, Mich., and N. Y. City.
- WAVERLY ELECTRIC.**
Longaker Co., V. A., 448-50 N. Capitol Ave., Indianapolis.
- WAYNE.**
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- WELCH-DETROIT.**
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- WELCH-PONTIAC.**
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- WESTERN.**
Puritan Machine Co., Detroit, Mich., and N. Y. City.
- WHITE STEAMER.**
Akeley-Steele Co., 79 Galena Blvd., Aurora, Ill.
- WHITING.**
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta, Ga.
Puritan Machine Co., 422 Lafayette Boulevard, Detroit.
- WOODWORTH.**
Puritan Machine Co., 422 Lafayette Boulevard, Detroit, Mich.
- YALE.**
Puritan Machine Co., Detroit, Mich., and N. Y. City.
- ZIMMERMAN.**
Auto Gear Co., 844 Eighth Ave., New York, N. Y.
Auto Gear & Parts Co., 291-93 Marietta St., Atlanta.
Council Bluffs Auto Parts Co., Council Bluffs, Ia.

The Improved Highway

(By FRANK M. HINKLE.)

I CARRY you from the frenzied trading place and lead you beside the running brooks.

I take you from the roar of the city's fevered mart, and lead you beside peaceful waters.

I carry you mile upon mile, away from dull care and humdrum monotony—through friendly meadows, and laughing flowers, and sparkling dew, into the sunlight, into the outdoors and the great open, and bid you drink deeply from the fountain of a life that ever is!

I lead you under the soft clouds, piled up like mountain waves in a sea of wondrous blue.

I take you out and on and forever on, into sunlit realms of placid quietude: out where feathered choirs sing anthem and roundelay in the branches of a thousand trees—out where nature makes loving mockery of the vain artistry of man.

I TAKE you through homey villages, through snug hamlets, through dale and dell and pleasant nook, through ever-stretching lanes far and away to the highlands where summits kiss the face of the sky.

I carry you over the spreading plains, over lowlands gently rolling, up and down the slopes, ever and on, everywhere and evermore.

Safely over high flung spans, looking down on torrents boiling and thundering—under great keystones thrown into nature's giant archways cut from the eternal hills—under frowning cliffs o'erhanging, where jut the defiant rocks of a million ages—onward I lead you, and onward still.

I CARRY you over the rugged mountains—beside crags upward rearing—under the sturdy oaks—under the redwoods—through gorges and valleys and canyons—skirting the water falls where the glistening cascade has been tuned by the infinite to the music of the universe.

And beside the gentle river, where the voice of God speaketh ever to the answering heart of man and the purling waters whisper love to human kind—and thence to the tranquil lake, and on to the ocean's shore where the soul of man looketh out upon the vast un-resting sea and saith unto itself, "Thou art of infinity!"—behold, I lead you on.

And thus I serve through all the passing years, and men do call me blessed evermore.

I am—the Improved Highway!

(Continued from Page 17.)

loss with a margin sufficient to show a profit in this business. Assuming five years as the insurance life of the average automobile, it will be seen that the companies buy these locks at an average price of \$17.50 each. It is known that not more than 1,000,000 labeled locks are in use and that at least one-half of these are 500,000 of the 6,000,000 automobiles which are not insured for theft. Accordingly, the views of the executives of the insurance companies, as to the value of this form of theft retardant, seem to harmonize with those of 500,000 automobile owners.

"At various times, attempts have been

made by our engineers to classify or grade automobile locks as to their relative efficiency. So far such classifications are of sentimental rather than practical significance. The insurance companies differentiate the "accessory" and the "built-in" types and offer a practical consideration of five per cent additional credit for the latter. This is not especially to recognize superior merit in the locking devices or methods, but to acknowledge the value of avoiding defective or faulty installations and of selecting a type suitable for the problem presented by the special features of the design of a particular make of automobile. Further, it is felt that standard locks on

the entire output of an individual maker is of practical benefit in the situation.

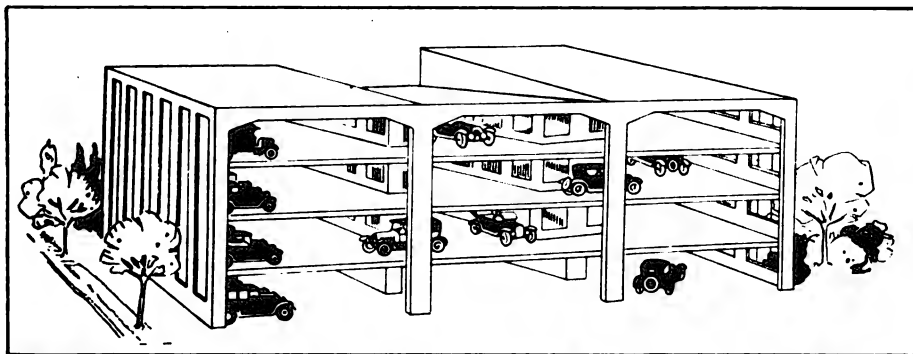
"Our engineering staff is preparing a new set of requirements for the performance of automobile locks. Presumably, when finally adopted, these will constitute a composite of the present standards. But it is certain that such protection against theft is adequate only for a day or two, if that long, for the reason that there is no standard thief. Accordingly, education must be resorted to for whatever fraction of the total risk remains when the estimated efficiency of locks, watchman and all other retardants is considered."

HERE'S REAL SERVICE

CONVENIENCE, personal service, courteous attention and reliable work have long been considered essentials in every garage worthy of the name. But the motorist who is much on the road knows how difficult it is to find one that combines all of these desirable qualities.

Imagine driving into a strange garage for some

minor repair and instead of having to wiggle your way through a maze of cars, posts and narrow passages, all of which are so dark that you have but little idea where you are going, you find a large concrete floor, flooded by light from windows on every side. A uniformed attendant jumps on the running board of your car and courteously asks your wants.



Phantom View of Fort Shelby Garage Showing Position of Inclined Planes by Which Access to the Several Floors is Had. No Elevator Here.

A GAIN, suppose that you kept your car in that garage regularly. Every morning you would find a report on the gas and oil tanks, the batteries and any repairs that might be urgent. Air, distilled water for the batteries and water for the radiators would be furnished free of charge without having to make a request. On rainy mornings, if you would rather not go out, you could telephone to the garage and a uniformed, experienced chauffeur would bring your car to your door. If all these things should happen you would say to yourself, "here, at last, I have found a real garage."

J. H. Shoemaker of the Electric Service Battery Company of Michigan, says that he has found such a garage in Detroit and writes of it as follows:

"It is not just a new, concrete garage, but rather it is a new departure in garage construction and management. It is evident that the idea has been appreciated by motorists and that the average driver is beginning to realize the fallacy of permitting his car to stand in the streets for several hours when such economical and safe protection is close at hand. The more this is realized the sooner will the losses from the present wave

of motor thefts be stopped."

The inclined plane feature of the Fort Shelby garage is new and is justifying all of the expectations of its builders. It does away with elevators and congested passageways and increases the accessibility of all points in the entire building. Included with this feature is another one of paying all employees high enough wages so that they are not more or less dependent upon what tips they can gouge from transient patrons. It is a feature that is enthusiastically welcomed by Detroit motorists.

TRADE OUTLET

AUTO SAVE 50-90% FOR 400 CARS PARTS

POPE, PACKARDS, PIERCE, BUICK, STEVENS-DURYEA, KNOX, OVERLAND, ETC.

| | | | |
|--------------|------------|-----------------|-----------|
| Motors. | \$25.00 up | Presto Tanks. | \$4.50 up |
| Magneto. | 4.00 up | New Spotlights. | 2.00 up |
| Carburetors. | 8.00 up | Generators. | 10.00 up |
| Rear Axles. | 15.00 up | Gears. | 1.00 up |
| Front Axles. | 5.00 up | Bearings. | 1.00 up |
| Cylinders. | 5.00 up | Radiators. | 10.00 up |

\$12 Diamond Bumpers.....\$5.50

Jobbers in Bankrupt Auto Supplies.

BRIGHTMAN AUTO EXCHANGE

321 Windsor Ave., Hartford, Conn.

Central Indiana manufacturers now marketing an entirely new Auto Accessory that makes night driving safe, eliminating glare from approaching headlights, want general sales managers to open branch office, handle exclusive territory and manage salesmen. Some investment necessary. Profit possibilities practically unlimited. RAY FILTER CO., Marion, Ind.

SIMPLEX

STARTER \$20

Attach it yourself to Ford Auto. Guaranteed. Agts. wanted. American-Simplex Co., Anderson, Ind.

TOLMAN MFG. Co.

MANUFACTURERS OF

WELDING



& CUTTING

APPARATUS

19-21 THIRD ST.
BOSTON

COES *The Standard* WRENCH



WRENCHES that are made for the hardest service. They do not break but grip and hold and their efficiency never lessens.

Economy tools as they last longer, give better service and never become useless through wear.

Utility wrenches of the highest order for car owners and repairers as they can be used in compact places and once set hold like a vise.

*The Best Wrench
The Cheapest*

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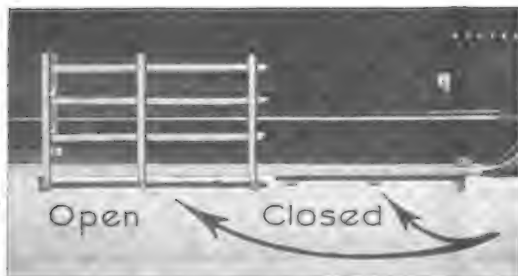
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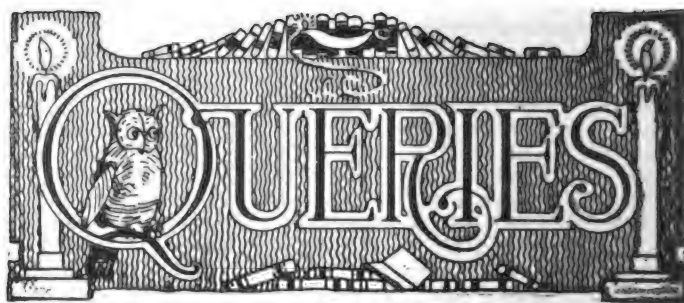
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OIL PUMP HAS KNOCK.

(L. H. S., Erie, Pa.)

My — motor has a loud knock in the oil pump caused by the pump piston hammering the driving cam. The pump has good smooth ball valves and registers on the dash indicator. Will you kindly suggest a remedy for this knock? It is very annoying.

This knocking may be caused by several mechanical rearrangements. The ones to look for first depend to a great extent upon the length of time the motor has been in use. It is suggested that you disassemble the pump. In the majority of cases this type of pump depends upon a coil spring for its ability to follow the cam race, and you should try this spring for loss of tension.

These springs, in a few cases have been broken, and in many instances have lost their tension after extensive use, causing the piston to be a trifle slow in following the cam. Upon passing the high point the piston leaves the cam race for an instant and upon reseating again a knock is developed.

Obtain a new spring of slightly greater tension and when reassembling install it in place of the one now in use. Try the piston and cylinder of the pump for concentricity and fit, as there is a possibility of the cylinder being worn, causing the piston to become canted and allowing it to stick in its reciprocating motion.

This will cause a decided pound and would necessitate your reboring the cylinder and the making of a new piston. The clearance between the piston and cylinder should not be more than .003 or .004 of one inch. Try the new spring first and be sure not to increase the tension too much or it will cause excessive wear upon the working parts. I believe you will find the solution of knock is one of the causes I have enumerated.

MAKING STORAGE BATTERY.

(V. H. B. Carreno, Chile.)

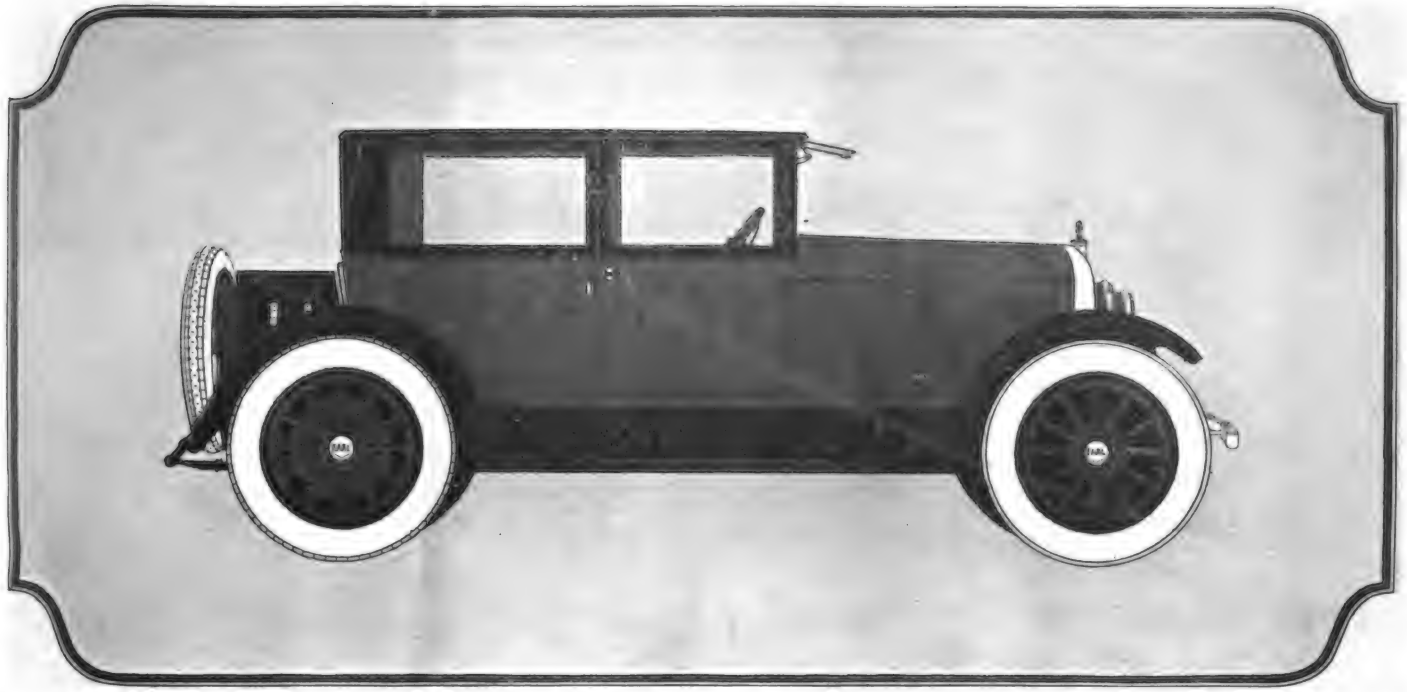
Could you inform me of just what and how the plates of a battery are made?

The composition of the various pastes used in storage battery manufacture is a trade secret with the different makers. The active material used in many pastes is litharge, and sulphuric acid is used in the mixture until it is about 1.120 specific gravity; the proportion of liquid to litharge is about 1 to 6. The mixing should be very thorough and as little acid as possible used.

After filling a grid, the plate is subjected to pressure and all the portions of the grid filled, the entire combination being tightly compressed. The plate is then dried in air. The drying usually takes about two weeks unless the plates are dried in an oven. The oven temperature should be about 195 degrees Fahr. The plates are again dipped in acid of a gravity of 1.100 and dried, to further harden, and are then ready for service.

Another of the active materials most commonly used is litharge (PB034) for pasting the negative, and minimum or red lead (PBO) for the positive. The negatives are connected as cathodes with "dummy" plates of sheet lead as anodes, and current passes through the group. The PBO34 on the positive plates is changed to PB02 by the addition of oxygen, which is supplied by connecting up against dummy plates in a sulphuric acid bath and passing current through the couple, the dummies being connected as cathodes and the positive plates as anodes.

(When Writing to Advertisers, Please Mention the Automobile Journal.)



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Its character and uncrowded ease are suggested by the "comfort specifications" printed in an adjoining column. The distinction of its sweeping lines, the rich harmony of gray Spanish leather within and Earl blue and black without, must be seen to be appreciated.

The Cabriole is the right size—the right price—the right combination of good looks, economy, and ability to go anywhere a motor car can be driven. And it carries the right discount.

A great selling season for closed cars is just opening. And the Cabriole is the most astonishing closed car value ever offered. Write or wire for full information about this sensational new car and our contract terms. Some profitable dealer territories are still unassigned.

Comfort Specifications

Generous body dimensions, with a very low center of gravity and perfect balance, make for unusual riding qualities in the Earl Cabriole. Its over-all length is 14 feet, lacking one inch. Coupled with 56-inch rear springs, a rigid 7-inch channel frame with five cross members, and special spirals in tilted cushions, this roominess provides road comfort unsurpassed by cars of much greater first cost and operating expense.

Low sweeping lines give the Cabriole its special distinction. Its over-all height without passengers is only 74 inches. Head room is ample, however—from seats to top lining, 37 inches. The front tonneau is 53 inches long. The rear seat is 45 1/2 inches wide, seating three without undue crowding.

The plate glass quarter window at the rear and each door panel can be raised or lowered without effort in the fraction of a minute. The one-piece, clear vision windshield swings inward or outward. Ventilation of the Cabriole, therefore, can be regulated to a nicety. The individual seats can be tipped forward at right angles, the backs folding flat. With the extra wide doors, this makes entrance and exit easy. The complete equipment includes sun visor, windshield wiper and dome light.

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EARL MOTORS, Inc.

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THE AUTOMOBILE JOURNAL

VOL. LXIX.

PAWTUCKET, R. I., JULY, 1922.

NO. 11.

The Gasoline Trippers

Story of a Party of Motor Campers and the Way in Which They Prepared to Hit the Trail Together with a Few Random Remarks of a More Intimate Nature.

WE DIDN'T know where we were—and no one was worrying much about the fact. Somewhere in the wilds of southern Missouri—or perhaps across the border into Arkansas—it made little difference anyway, so long as we stayed in the United States. Having been on the trail for a week we were full fledged motor campers—"gasoline-tortoises"—carrying our home with us, and life was all too short for a careful study of road maps.

We had pitched camp for the night on a gentle

slope that fell away to a swiftly flowing "creek," as any fairly large sized brook is called in that part of the country. Fishing was fine and the menu had been trout for last night's supper accompanied by the usual camp fare. Now it was time to think of another meal because the sun had been up for an hour and already the camp was astir. "What's for breakfast?" asked the daughter of the house, finishing a hasty toilet by running a comb through her bobbed hair. Did we get anything on the trot-line?"

THE trot-line, by the way was an entirely new method of catching fish—to me at least—and as the reader may know as little about it as I did a word of explanation seems in order.

The trot-line, and I make the statement regardless of who it may hit, is distinctly a southern—or southwestern innovation that allows a lazy man as good a chance at the fish as his more industrious brother through greater efforts may have. In brief the trot-line, blood brother to the codfish trawl of our Atlantic waters, but requiring a whole lot less work to operate, is nothing more nor less than a fairly long line of heavy gauge to which foot long lengths of finer line, provided with hooks, are attached at intervals of every six or eight feet.



Which Is It, Breakfast or Dinner? Whatever It Is It'll Soon Be Ready Thanks to the Handy Stove. (Photo Loaned by Buckbee-Mears Co., St. Paul, Minn.)

When it is desired to use the trot-line (which is all the time in those southern communities that are fortunate enough to lie in what may be termed the cat-fish belt) one end is tied to a convenient tree on the bank of river or creek, each individual line is carefully arranged so that it will not snarl; hooks are baited and the other end of the trawl—or trot-line, if long enough, is carried across the creek and tied to another tree, lead weights placed at intervals on the larger line sinking the whole to the bottom. Frequently the line may not be of a length that will stretch across the river and in this case the off-shore end is anchored with the first rock that comes to hand.

To my way of thinking the man who invented the trot-line was a poor



Eating Again. Food Seems to Play an Important Part in the Life of the Motor Camper. Surely This Makes a Pleasant Out-Door Dining Room.

sport—or he may have been just a “good provider.” I can picture him now as he sat in the shade of a “sycamoh” tree, lazily whittling on a “piney-stick” and trying to figure out some way by which he could catch fish without exertion. It was a matter of business with him—if the several of his kind that I saw could be said to have any business; his big scheme being to get a maximum of eats with a minimum of effort.

At first he couldn't quite devise the right method, but finally—after he had chewed up a pocketful of “natural-leaf” and whittled half a cord of wood in his cogitations—he hit on the idea of the trot-line and believe me, much as I may bewail the unsportmanlike method of catching fish, it surely works effectively, or at least it did on the morning of which I speak as the 14 catfish of varying sizes that I took off the trot-line with the aid of the aforementioned young lady emphatically proved.

The average city bred girl hates like the mischief to tackle a fish with anything other than a silver-tined fork, but the one I am talking of not only helped me take the fish from the line, but did her share of getting them ready for the pan (and eating them); such is the influence of contact with the “great outdoors,” (as it is bromidically called—“where a man's a man”—and all the rest of the old familiar bunk.) Yes sir—this young woman was city bred, highly educated and refined and I'll gamble that one month previous to the time she stooped over a flat rock on the bank of a big brook in the southern wilderness and helped me dress fish she had never tackled one in her life without the aid of a linen napkin and the aforementioned silver-tined fork.

I was thinking along this line as I dusted the fish in corn meal at her suggestion and passed them to her to be put in the pan where the salt pork has been busily frying for several minutes. “How does it happen that you don't gather up your skirts and run at the sight of these smelly fish?” I asked and wondered what her answer would be.

She laughed. “In the first place, to answer your question quite literally,” she said, “I'm wearing khaki riding breeches and not skirts, and in the second place I'm hungry enough to eat the fish raw. It's the democratizing influence of get-

ting back to nature, as my psychology teacher would call it—or something like that.

“Perhaps its the philosophy of motor camping. Whatever it is I'm too hungry to give you a dissertation on the question right now—but I'll think the matter over and tell you after breakfast perhaps, although I'm not sure that I want to bother with it because I'm out to have a good time—pass me the salt,” and because she is my cousin and not above becoming saucy on occasions, I passed the salt and hastened to rescue the coffee pot that had boiled over and threatened to put the fire out.

Any kind of camping is getting back to nature in a manner that leaves a man no room to doubt the artificiality of the or-

when I was suddenly enjoined to “come to life and feed my face” by my energetic cousin—and for the next few minutes had little time to give to anything but food. And then after breakfast there were dishes to be washed—the very fewest possible—a pipe to be smoked and after we sat for a while a swim that started at 10 o'clock in the morning and lasted for three hours.

The life? I'll say it was.

Lunch for a change—was trout again. I had caught them after we came from swimming and they were hard and firm; fresh from the water and a dish the eating of which a king might have envied us. As I look back on them and others of their genus, browned in the pan with fried corn meal mush—it makes my mouth water—sitting here at my desk and looking out across the roofs and spires of the smoky city of Pittsburgh where I am at the present moment—a long way from motor camping; and still not such a long way because my vacation starts next Monday morning and I intend to have another go at motor camping just as soon as that day rolls 'round.

The person who has never had a real wilderness dinner such as we had that night cannot appreciate to the full the good things of nature. Fish again (you can eat them three times a day when you catch them right fresh from the stream), sweet corn—borrowed from a neighboring farmer who lived down the creek “a piece”—sweet potatoes baked in the ashes, a pie—as flaky and light as ever a domestic science graduate turned out—made from the huckle berries that grew as large as grapes within



Just for a Change and to Give the Automobile an Occasional Rest It's Pretty Nice to Take a Boat Ride. (Photo from Evinrude Company.)

dinary way of living. Camping broadens one mentally and physically, gives him a chance to become normal and awakens in him a desire for the more enduring things of life. Motor camping does more than this because it broadens his vision to a point where he comes nearer to understanding the great secrets of the universe than that at any other time. I was thinking along these lines—philosophizing to myself like another Robinson Crusoe on that fine summer morning,

three rods of the camp—more of that wonderful coffee, sliced peaches out of a can—if you wanted them—and you did because living out doors makes you want anything that is eatable (this holds true, regardless of how fastidious you may be—with everything from canned beans to Hawaian pine apple)—it was a real feed, if you know just what I mean.

I'd like to go on and tell you of the fun we had on our camping trip—how we climbed mountains; cut down a bee tree;

picked wild strawberries and fashioned candles from sweetly smelling bay berries tried out in the camp kettle using tubular shoe laces that were more ornamentable than utilitious for wicks; how one day in searching around for the location of an elusive column of ever-ascending smoke we ran into a typical southern "still," that was operated by two lean, single-suspected mountaineers, who, true to type, leaned on long rifles and looked us over with coldly calculating eyes. I'll never forget that experience. It was illuminating—to say the least.

"What yer want hyer?" asked the taller of the two men as he ceased chewing for a moment and gravely inspected my cousin and me.

"Nothin. We're just looking around," I answered nervously, glancing askance at the squirrel rifle that the man carried.

"S'pose he's tellin' true Ruby?" asked the mountaineer, turning to his companion.

"I dunno, Patience," answered Ruby as he took careful aim and strangled a rod distant grasshopper with a smoothly shot mouthful of "blackjack" tobacco juice. "Nobody usually don't."

An impressive silence followed. Finally my cousin, with her prettiest smile—and she's got everything, that girl—came to the rescue. "He's a writer," she said sweetly. "We're just looking around a bit as he says. He, ah—writes—things."

"Schoolmaster hey? drawled Patience. "Does he look like a schoolmaster to you Ruby?"

"I dunno," answered Ruby non-committally. "I never see one."

The first speaker then turned to me. "Be you a schoolmaster," he persisted.

"No," I answered truthfully. "I'm a writer. I—er—write."

"Schoolmasters write, don't they?" returned Patience after thinking the matter over for several hours.

"Yes—I suppose they do," I answered gently. "But I'm a writer—not a schoolmaster."

This was too much for him. He puzzled over it for a moment, gravely inspected my gold-rimmed spectacles, and then scratching the back of his right ankle with his bare left foot said reflectively, as though settling the question, "Schoolmasters write, and you say

you're a writer, so you must be a schoolmaster. Be you aimin to teach hereabouts?"

"Did you ever read Alice in Wonderland?" I countered.

He shook his head. "Did you, Ruby," he asked slowly turning to face the other mountaineer.

"I never read nothin," returned Ruby thickly as he devastated another grasshopper with an accumulated mouthful of tobacco juice.

But my cousin—it's a way she has—

few fistfulls of their mountain dew cocktails, I insisted on debating the question with her. My uncle, however, who with myself was informally entertained at afternoon tea by these southern gentlemen on several occasions emphatically concurred in my opinion. I'll say he did.

Yes, I could go on and tell you a lot more of the details of our camping trip last summer, but I don't want to bore you and besides there isn't space to say all I'd like to on the subject, so I'll just



This Picture Snapped at Twilight Shows a Party of Auto Tourists Taking It Easy in Camp. Note the Tent-Like Covering for the Automobile.

finally convinced them that we were not more than the motor campers we had professed to be—not "revenooers" nor interested in stills except in a purely aesthetic way—and with this they were satisfied, the more so when I told them that though other engagements had demanded my attention during the Civil War I had always been against the Abolitionists. That made me solid for life with these two strange beings—who for all their resemblance to our kind might easily have stepped down from another planet.

But they had a purpose in life—a worthy purpose in these days of arid drought. I'll say they did.

My cousin—as broad-minded a flapper as every flapper didn't wholly agree with me, however. She got peeved to tell the truth when in trying to lead me gently back to the camp after I had sampled a

press on to the bigger points of the tour.

My uncle, by virtue of having been born on a farm and spending his early youth in the wildest sort of country, is an expert on camping matters. He knows just what to take with him into the woods to be comfortable. He's a real nature lover and since his residence in the city (made necessary through having to care for the business incident to a fortunate invention of his) has always managed to get back to the forests and streams for at least a month every year.

He doesn't in the least care for fancy summering places and prefers to get out and rough it. For a long time he had a camp in the Maine woods, and went there for fishing and hunting, sometimes spending two months of the year in this manner. Since the development of the automobile to the point where it is en-



Don't Know Where This Man's Family Is; Probably Gone for a Swim and Left Him to Unload the Duffel and Get Supper Ready. He Looks Husky Enough to Handle the Job Though, so We Won't Waste Our Sympathy.

tirely efficient, another method of getting back to nature has come to occupy his time, and I firmly believe there isn't a more enthusiastic motor camper in the country today than he—unless it be myself.

He is so situated as to be the owner of several fine cars. He also has a smaller machine; this is the one that gets the

Tire chains, preferably two sets, are necessary equipment with a half dozen extra cross chains. He carries a steel rope for towing, a collapsible canvas bucket and a five-gallon canvas water bag; also one upper and one lower rubber hose connection for radiator, with clamps; he also takes along a two-pound box of cup grease, a spout oil can, a gal-

the overflow hole as he says that it escapes at the brake drums and spoils the efficiency of the brakes besides causing injury to the tires.

Needless to say no chauffeur is taken along on the camping trip. Neither are good clothes of the dress-up kind allowed. Every member of the party (there were four of us last year) wears khaki suits. The men by preference don old hunting togs, while my aunt wears a shower proof suit with short skirt and my cousin, as noted in the foregoing, dresses in a riding costume consisting of short riding breeches, puttee leggings, a shirtwaist of some easily washable material that needs no ironing and (when she isn't bareheaded) clings to a rather disreputable sombrero hat which was a part of the costume I wore on a recent



A Real Camp That from Appearances Would Be Comfortable Either for a Short Stop or a Permanent Wilderness Home.

call when there's motor camping to be done. The first thing that he does when he starts on one of his trips is to have this car gone over thoroughly by his chauffeur, who is an expert repairman.

He then looks over the tool box himself and sees that it contains the necessary equipment, such as open end wrenches, a fair sized monkey wrench, a 10-inch Stillson, a spark plug socket wrench, a pair of pliers, also chain repair pliers, a mechanic's hammer, a large and a small screw driver, files, a spool of soft iron wire, a box each of assorted nuts, bolts and cotter pins, a box of extra tire valves, a tire pressure gauge, some extra spark plugs and rim lugs, a box of talcum powder, a few feet of high and

low can of extra lubricating oil, a can of carbon remover—and this last is fairly important by the way.

To carry duffle bags, tent, commissary boxes and other camp equipment securely on the running board, he has equipped the car with a folding parcel carrier through which run webbing straps for fastening the equipment snugly. Similar loops are also screwed to the tonneau floor to be used for strapping down suit cases or other baggage to keep them from shifting and annoying the passengers.

He sees that the car is in good working order and has all parts well lubricated before starting on the tour and the battery fully charged. The service and emergency brakes are adjusted to function properly, the top put in good shape and the curtains repaired if this seems necessary. Side curtains are numbered to facilitate quick attachment in a sudden storm.

Proper lubrication is a hobby with this man. He deems it absolutely essential to the best and most economical performance of the car and is very particular on this point.

When touring he turns down grease cups and fills oil cups and oil holes every day; lubricates spring leaves often; replenishes oil in crank case every day, renewing it every thousand miles.



Most Anyone Can "Fry Two Sunny-Side Up" with a Stove of This Kind.

visit to France when at the request of the local draft board I sailed away to investigate certain overseas conditions some four or five years ago.

The camp equipment used by my uncle on many motor trips is the result of experience rather than the dictates of any person. In the first place every piece of the outfit is chosen carefully from the viewpoint of actual service.

When he first started "hitting the highways with the ubiquitous flivver" he car-



An Outfit That Comes in Handy at Times as Many a Camper Can Testify.

low tension cable, a roll of tape, an extra valve and spring, a grease gun, an extra spring clip and bolts, an extra fan belt, a sheet of cork for emergency gaskets and a small bottle of shellac.

He makes it a point before beginning the journey to see that his tires are in good condition with two extras, preferably inflated on rims and covered or painted; three extra tubes, carefully rolled and packed in burlap to keep from chafing; a box of tube patching outfit for punctures and blow-out patch or inner boot. A tire pump in good order and a good jack; also a small piece of plank two by six by eight, to use as a base for the jack in soft ground is also carried.

Tent with Beds Similar to the One Mentioned in the Story. It Looks Substantial and Is Easily Erected.



He also replenishes grease in the universal joint every 500 miles even though it is hard to reach underneath the car and is particular not to put heavy oil into the differential above the level of

ried a great amount of paraphernalia for which he had little use. The next year he added other equipment and scrapped that which had not proved to be just the thing on his previous trip,



Here's a Broiler Tin That Fills a Long Felt Want in Camp Cookery.

and continued along these lines, so that his present equipment may be said to have been chosen by the process of elimination and you may take my word that it is efficient in every way.

The tent used is one of several good



This Little Outboard Motor Will Drive a Row Boat at Mighty Good Speed.

ones that have been especially designed for the work. This tent, as I remember it, is made of duck about 10 ounces in weight. Attached to the car at the side, it extends outward about 10 feet I should say, and slopes down to a low point of

perhaps four feet. A curtain extending at right angles with the car divides the shelter into two separate parts, one of which is occupied by the women in the party, the other being used by the men.

The tent, folded up into a small compact bundle easily goes under the cushion of the rear seat and is entirely out of the way when touring. The outer side, or side away from the car may be hoisted

Still Another One of Those "Food Pictures."

The Man in the Picture Is to Be Congratulated on the Attention He Is Receiving. "Who Wants the Handsome Waitress?"



out of the way and there are mosquito bars that exactly fit into the space left by hoisting the sides, the whole arrangement making an unusually comfortable and insect proof room.

Frankly, I prefer this tent to a log cabin or similar shelter, not only because it can be easily knocked down and packed away (we have broken camp and been driving in less than 25 minutes from the time we started to take up the first tent stake), but also because it can be placed wherever fancy dictates, either close to the water or away from it as is desired, and also because of the arrangement mentioned that makes it possible to sleep in the open air in a sense while having ample protection from "insect pests," and believe me the man who coined that phrase said a jugful. If you

want to know just how true it is, go on a camping tour without mosquito bars or "dope" of some kind and see what a real pest an insect can be.

Then, too, the auto tent has other marked advantages. For one thing it is especially convenient when one wishes to undress for bathing—and this frequently happens twice a day. Almost always pitched fairly near the water the tent

makes a superior place for disrobing preparatory to the swim.

Another item that occurs is the tendency on the part of every camper I ever have known to take a nap for himself some time during the day and here again the auto tent comes into play.

The beds used by my uncle on his camping trips are especially made cots that hold one person. They are an adaptation of the army cot, although they differ quite materially in many ways. These cots have no legs, strictly speaking, but are merely flexible mattresses with flat springs and can be folded once to fit into the tonneau of the car when touring.

The suspension of these cots from the ground to my mind is highly ingenious. Two legs are driven into the ground, one in the women's compartment of the tent, the other in the men's. A bar paralleled to the side of the car is then pushed through a hole in the dividing curtain and attached to the two legs by means of shackles. Side bars are then run from this paralleled bar to the underside of the car, one at each end, where they fit into sockets specially placed. Another paralleled bar of the length of the first is then set into place at the side of car and the frame work is ready to receive the beds or cots which are hung on the bars by means of loops. It sounds somewhat complicated; this method I have described, but you'll find if you shut your eyes and visualize the arrangement it's really very simple, and I believe that any one skillful with tools could easily duplicate it.

The coverings for the beds, inasmuch as I am of rather a heavy build and proportionately tall, didn't quite suit me and I believe that I can design something that to my mind at least will be a whole lot more comfortable. They are in effect a kind of sleeping bag fashioned of a sin-

(Continued on Page 44.)



Motor Camper Fishing. Note Look of Anticipation. Probably Thinking of Fried Fish. (Photo from Sigmund Eisner Co.)

LEGAL POINTS

By SAMUEL WANT

IN PRECEDING articles attention has been called to the rule of law that a person, who is injured in an automobile accident, will not be awarded damages upon mere proof of the accident and the resulting injuries in a suit against the motorist. The essential additional fact that must be proved is that the accident was due to the failure of the motorist or his chauffeur to use the degree of care that ordinarily prudent men would have exercised under similar conditions. If this fact is proved and it appears that the accident was due to such neglect, unmixed with concurrent neglect on the part of the injured person, the latter is entitled to damages. Not otherwise.

Very recent cases to which this principle has been applied are as follows:

In a Wisconsin case a car was overturned, causing the death of a passenger. There was no evidence from which it could be definitely ascertained how the accident occurred. It did appear that when the car was examined after the accident, the tire of the front wheel was deflated, and that just before the accident the car had been travelling at the rate of fifteen miles an hour. The court held that the accident might have resulted from the blowout of the tire, and that as there was no evidence pointing to negligence on the part of the driver, the owner of the car was not responsible in damages to the relatives of the decedent.

In a case decided in Iowa, a pedestrian on the sidewalk was struck by an automobile. There was no evidence to show the cause which led the driver to permit the car to get on the sidewalk. Under this peculiar state of facts, the court decided that proof of negligence was not necessary to justify the recovery of damages.

As there can be no justification for the presence of an automobile on a sidewalk except under a very extraordinary state of facts, the court ruled that mere proof of the fact stated was enough to create a legal inference of negligence against the motorist.

In an Ohio case, it appeared that a prospective purchaser was examining a car. While he was standing in front of it and the demonstrator was manipulating the parts for the information of the former, the car suddenly started forward, injuring the intending purchaser. There was no evidence to account for this unusual occurrence—that is to say, no evidence of negligence within the rule above stated.

But the court held that as this case too was an exception to the general rule. It applied the reasoning of the above mentioned Iowa case, and awarded damages for the injuries sustained by the prospective purchaser.

A RULING similar to those made in the last two cases was made in a recent Pennsylvania case. Here it appeared that a man and his wife hired a car together with a chauffeur. The chauffeur got out of the car during the trip for the purpose of visiting a nearby store. When he had gone a few feet the car started off and ran into a ditch. The occupants were injured and were awarded damages.

A RECENT Tennessee case holds that a county is not entitled to damages for injuries done to the public roads by reason of the unusual weight of loads carried on the trucks of a particular person. The rule would be otherwise, the court said, if the damage resulted from reckless driving or improper management of the trucks.

The above is the rule where there is no special act of Legislature. On this account the Legislatures in several states have passed special laws limiting the weight of loads and the size of trucks. Attention has been called to some of the legislation in preceding articles.

MANY decisions have settled the point that statutes regulating common carriers of freight and passengers apply only to automobiles which are offered for public hire. Also the transportation of passengers or freight by motor vehicle from a point in one state to a point in another is "interstate commerce" within the meaning of statutes of Congress governing such commerce. An apparent limitation on the principle of these decisions is to be found in a recent Federal case, which decides that it is not "interstate commerce" for a man to transport his own goods, in his own car, and for his own use (i.e., not for the purpose of sale) from one state to another. Hence the Federal statutes, which prohibit interstate commerce in certain articles, do not apply to the transportation of such articles by motor vehicle under the special circumstances indicated.

IN A recent decision of the Supreme Court of Tennessee, one of the counties of the state sought an injunction against a trucking company to prohibit it from drawing its ten ton truckloads over the roads of the county. The ground of the application was the fact that the roads had recently been macadamized and that when the work was done it was not in contemplation that loads of over 3000 pounds would have to be supported. For this reason, it was contended serious damage was being done to the county roads to the great loss of the taxpayers. The court held, however, that this position could not be sustained in view of

the unqualified right to use the public roads connecting the various counties of the state. Of course, if there were more than one road traversing the distance between the two points, it would be competent for the Legislature to require heavy loads to be carried over one of the other such ways, but, where only one road exists between two points, not even the Legislature has the power to prohibit ordinary traffic.

IN VIEW of a recent decision of the Supreme Court of Tennessee, it may be questioned whether the advantages accruing from the joint purchase of an automobile are not offset by the disadvantages incident to joint ownership. According to this decision, where a brother and sister own a car jointly, sharing all the expenses, including the salary of the chauffeur, the sister may be held liable for an accident due to the negligence of the chauffeur when he is driving the car from the garage to the brother's place of business to take the latter home.

THE rights of repairmen for labor and incidental supplies in connection with the repair of an automobile are emphasized in a recent decision of the Court of Appeals of Maryland. In this case it is held that the general rule of law to the effect that a repairman loses his lien where he parts with the car after completing his work upon it has no application to a case in which, upon the application of the owner, the repairman sends the car to an upholsterer to be measured for covers, the car being in charge of the repairman's helper and being promptly brought back to the garage after the measurements are made.

In the same case it is pointed out that the lien of the repairman is superior to the rights of the seller of the car under a conditional contract of sale held by the latter, under which title to the car is reserved by him.

IN A recent decision of the Supreme Court of Georgia an unsuccessful attempt was made to hold a bank liable for breach of warranties in the sale of a car under the following state of facts: The car was owned and sold by the cashier of the bank, who represented to the purchaser that the bank had an interest in it and had also loaned to the purchaser from the bank's funds the money with which to pay for the car. The cashier also made specific warranties as to the condition of the car and represented that the bank would be responsible for compliance with these warranties.

THE general principle of law that, where an agreement has been reduced to writing, the parties will not be permitted to offer oral proof of conditions in conflict with the terms of the written instrument was applied to a contract for the sale of an automobile in a decision just handed down by the Court of Appeals of Maryland. In this case, which was a suit by a dealer on a note given to cover the purchase price of a car, the maker of the note contended that he had an agreement with the dealer whereby he was to deliver to the latter, in settlement of the note, a certain used car and a stipulated amount in cash. His explanation of the note was that this was given simply to bind the transaction pending unavoidable delay in the delivery by him of the used car. As the agreement thus set up was verbal and contradicted, the unqualified written agreement to pay, which was evidenced by the note, the court held that this proof should not have been admitted and that the maker of the note was liable in accordance with its terms.

SOME of the dangers and risks incident to the towing of a car in the public streets are shown in a decision of the Pennsylvania Superior Court. From the facts of this case, it appears that a pedestrian waited on the curb of a street for a truck to pass and then proceeded across the street. He was tripped up by a sagging tow rope which connected the truck with another car, but which the pedestrian did not see. The accident occurred on a dark night and the distance between the truck and the car, which was being towed, was such that it would not have been imprudent or legally negligent to have attempted to pass between the two cars if both had been proceeding under their own power.

Without pointing out just what act of negligence on the part of the drivers of the cars could be held to be responsible for the accident, the court decided that a verdict in favor of the injured pedestrian should not be disturbed. The implication is that a light from either the rear of the truck or the front of the car which was being towed should have been played upon the tow rope so as to indicate its presence.

AUTOMOBILE accident policies contain a provision to the effect that, in the event of a claim being made against the motorist for an accident within the terms of the policy, the insurance company may take over the defense of the suit against the motorist. But, if the judgment rendered against the motorist is for more than the amount of the policy, the insurance company's liability is limited to the face of the policy and the motorist must pay the difference. In a New York case, where the policy was for five thousand dollars, a claim against the motorist for a large amount was defended by the insurance company. The suit resulted in a verdict for thirteen thousand dollars against the motorist. Upon the assurance of the company's attorney that an appeal would be taken, the motorist took no action for his protection. No appeal was, however, taken

within the required time, due to the negligence of the Company's attorney, and the motorist was compelled to pay the judgment. The company paid him the amount of the policy but refused to pay more, and suit was brought by the motorist against the insurance company for the difference. The court held that the insurance company could have defeated the claim if it could have shown to the satisfaction of the court that an appeal in the damage suit would not have resulted in a reversal of the verdict, but no proof of this was offered. A judgment was, therefore, awarded in favor of the motorist.

IN A case just decided in New York, an insurance Company refused to pay a motorist the amount which he had been compelled to pay for the death of a pedestrian, due to the negligent operating of his car. The company's defense was that at the time of the accident the car was being driven by a child of the motorist who was under the legal age, and it contended that its policy was not intended to protect a motorist who permits his car to be driven in violation of law. The court refused to accept this view of the situation and required the company to make good the loss.

ACIVIL suit for damages for the death of a sheriff recently decided by the United States Court of Appeals points out a novel application of the law of arrest as applied to automobiles.

The facts of this case show that a motorist, who was on a West Virginia road, was hailed by a sheriff who told him that he was under arrest by virtue of a warrant which the sheriff exhibited as the car approached. It appears that this occurrence was near the State line, and the motorist, instead of stopping and submitting to arrest, speeded up his car in an effort to get across the line. The sheriff jumped on the running board, and, in a tussle which ensued for control of the wheel was driven against the side of a bridge and the sheriff was killed.

In deciding that the motorist was liable in damages to the relatives of the sheriff, the court pointed out that when the sheriff mounted the running board of the car exhibiting his warrant, he had the legal custody of both the motorist and the car, so that the act of attempting to get across the line to render the arrest ineffective amounted to a resistance against a lawful arrest. On this ground the court decided it was immaterial whose specific act caused the car to strike the bridge, thus eliminating from the case the contention of the motorist that the sheriff caused the accident in attempting to get control of the car.

AFORM of hysteria, which manifested itself in an uncontrollable fear of automobiles is an element of injury for which the jury may make an allowance in assessing damages in an automobile accident, according to a recent decision of the Supreme Court of the State of Washington.

A RECENT decision of the United States District Court in Michigan is of especial interest to manufacturers who supply parts for the business of assembling cars and to tire makers.

In this case, one of the large tire companies had been supplying tires and rims to a company engaged in assembling automobile parts for a car of its own manufacture. The contract between the parties provided that the tires and rims should remain the property of the tire company even after being attached to cars, until paid for, and the purchaser agreed to maintain a special trust account for keeping separate that part of the price of all cars sold which represented the cost of tires and rims. The manufacturer being subsequently declared a bankrupt, a contest ensued between the tire company and the trustee of the bankrupt court for the tires and rims on hand.

The court held that under the broad provisions of the bankrupt law as now existing, the tire company could not recover the material.

The moral of this case is that the tire company should have recorded its agreement. This would have given it complete protection as against the creditors of the bankrupt. Upon the same principle, a motorist who sells his car on time should have a recorded bill of sale or chattel mortgage covering the unpaid balance of the purchase money; in no other way can protection be obtained against the claims of the general creditors.

PERSONS who are in the business of hiring cars are under a legal obligation to see that their drivers are thoroughly competent for the business in which they are engaged. In a recent Tennessee case it appears that a passenger in a hired car was injured as a result of the unfamiliarity of the driver with the control of the car and the particular locality in which he was driving. The owner of the car was held responsible, notwithstanding the fact that he proved that his driver was duly licensed and came to him well recommended.

STATUTES and decisions against price-fixing seem to have been successfully circumvented by at least one automobile manufacturer. This concern contracted with an agent to supply him with a given quantity of cars. He agreed to pay 85 per cent of the selling price of the cars upon his receipt of the same, and stipulated that he would sell the cars at a fixed price and give specified service to purchasers. The net result of the arrangement was that the so-called agent was really a retail dealer restricted as to his prices, and receiving a profit of 15 per cent on each sale made by him.

The agent attempted to get away from his contracts as to the selling price of the cars, contending that it violated the law against price-fixing. The court, however, regarding the form rather than the substance of the transaction, held that the contract was one of agency only and, that, therefore, the manufacturer could limit the price to the ultimate purchaser.

Lincoln Highway Camp Sites

THE number of tourists carrying camping equipment and making but a minimum use of hotels during their summer drives seems to be increasing yearly. Even parties intending to stop at hotels frequently now carry camping equipment and enjoy making a camp now and then when facilities offer. The Lincoln Highway Association this year received an unusually large number of requests for information as to the location of specially equipped camp sites with the result that the following data have

been compiled. In general, of course, the tourist can make a camp almost anywhere between New York and San Francisco without interference from the owners of property and many tourists like to make a separate private camp, well away from town or city. However, more and more communities each year are providing free camping grounds within their municipal limits, often elaborately equipped with facilities for the comfort and convenience of the tourist, and they are largely patronized.

SOME of these camps often harbor as many as 2000 persons at a time, notably those in the West, which are located at strategic points, such as the crossing of main trails.

In the following table no attempt is made to detail provisions made for the comfort and convenience of tourist campers at each point. This is unnecessary, as it will be understood that the elaborateness and completeness of the camps generally vary proportionately with the population of the communities providing them. Water and fuel are, of course, available at all of them. At all of the points listed special grounds have been set aside for the free use of campers, convenient to the city itself, and tourists are welcome and treated with consideration. As new municipal camps are established along the Lincoln Highway revised lists will be announced by the Lincoln Highway Association.

Towns and Cities on the Lincoln Way Providing Free Municipal Camp Grounds for Tourists.

New York to San Francisco—3305 Miles.

| City | State | Population |
|----------------|----------|--|
| Caledonia Park | Penn. | State Camp between Gettysburg and Chambersburg |
| Ligonier | Indiana | 2,000 |
| La Porte | Indiana | (2 camps) 15,000 |
| Dyer | Indiana | 500 |
| Plainfield | Illinois | 1,200 |
| DeKalb | Illinois | 8,000 |
| Aurora | Illinois | 40,000 |
| Clinton | Iowa | 25,000 |
| DeWitt | Iowa | 2,000 |
| Calamus | Iowa | 300 |
| Clarence | Iowa | 700 |
| Marion | Iowa | 4,500 |
| Cedar Rapids | Iowa | 45,500 |
| Belle Plaine | Iowa | 3,900 |
| Tama | Iowa | 2,600 |
| Marshalltown | Iowa | 16,000 |
| Nevada | Iowa | 2,700 |
| Ames | Iowa | 6,500 |
| Boone | Iowa | 12,450 |
| Grand Junction | Iowa | 1,500 |
| Jefferson | Iowa | 4,000 |
| Scranton | Iowa | 1,000 |
| Dennison | Iowa | 3,600 |
| Woodbine | Iowa | 1,600 |
| Council Bluffs | Iowa | 36,000 |
| Omaha | Nebraska | 190,000 |
| Fremont | Nebraska | 10,000 |
| Valley | Nebraska | 800 |
| North Bend | Nebraska | 1,300 |
| Schuyler | Nebraska | 2,600 |
| Columbus | Nebraska | 5,500 |
| Silver Creek | Nebraska | 800 |
| Clarks | Nebraska | 1,000 |

| | | |
|----------------|------------|---------|
| Central City | Nebraska | 2,500 |
| Grand Island | Nebraska | 14,000 |
| Wood River | Nebraska | 900 |
| Gibbon | Nebraska | 1,000 |
| Elm Creek | Nebraska | 750 |
| Lexington | Nebraska | 2,500 |
| Cozad | Nebraska | 2,000 |
| Gothenburg | Nebraska | 2,200 |
| North Platte | Nebraska | 10,500 |
| Sutherland | Nebraska | 700 |
| Ogallala | Nebraska | 1,500 |
| Brule | Nebraska | 200 |
| Chappell | Nebraska | 1,300 |
| Lodgepole | Nebraska | 500 |
| Sidney | Nebraska | 3,000 |
| Potter | Nebraska | 500 |
| Dix | Nebraska | 400 |
| Kimball | Nebraska | 2,000 |
| Bushnell | Nebraska | 400 |
| Cheyenne | Wyoming | 14,000 |
| Laramie | Wyoming | 6,500 |
| Rock River | Wyoming | 600 |
| Medicine Bow | Wyoming | 300 |
| Fort Steele | Wyoming | 200 |
| Rock Springs | Wyoming | 6,500 |
| Green River | Wyoming | 2,200 |
| Fort Bridger | Wyoming | 100 |
| Evanston | Wyoming | 3,500 |
| Coalville | Utah | 1,000 |
| Salt Lake City | Utah | 118,000 |
| Tooele | Utah | 3,600 |
| Ely | Nevada | 2,100 |
| Fallon | Nevada | 2,000 |
| Reno | Nevada | 13,000 |
| Carson City | Nevada | 1,700 |
| Placerville | California | 3,000 |
| Sacramento | California | 66,000 |
| Stockton | California | 43,000 |
| Tracy | California | 3,000 |
| Haywards | California | 3,500 |
| Dutch Flat | California | 50 |
| Auburn | California | 2,300 |

Auto Club Aids Tourist.

For the benefit of the transcontinental automobile tourists, who seem to be increasing this year, the Automobile Club of Southern California, with headquarters at Los Angeles, has just prepared an exceptionally convenient set of road maps by sections over the Lincoln Highway route. Many prospective cross-country tourists from this locality have been inquirers of road conditions and accommodations at the Touring Bureau of

Raw Materials Used in Construction of Cars and Trucks During 1921

| | |
|--|-------------|
| Iron and steel, tons | 1,464,000 |
| Production of iron and steel, 1921 (Iron Age) | 36,150,000 |
| Per cent. used in manufacturing cars and trucks | 4% |
| Aluminum, pounds | 43,250,000 |
| Production of aluminum, 1920 (American Metal Market) | 198,000,000 |
| Per cent. used in manufacturing cars and trucks | 22% |
| Copper, pounds | 83,425,000 |
| Production of copper, 1921 (Survey of Current Business) | 510,000,000 |
| Per cent. used in manufacturing cars and trucks | 16% |
| Tin, tons | 12,510 |
| Total consumption of tin, 1921 (American Metal Market) | 60,000 |
| Per Cent. used in manufacturing cars and trucks | 20% |
| Lead, tons | 6,670 |
| Production of lead, 1921 (American Metal Market) | 390,000 |
| Per cent. used in manufacturing cars and trucks | 1.7% |
| Nickel, pounds | 3,400,000 |
| Leather, upholstering, square feet | 37,165,000 |
| Total production of upholstering leather, 1921, estimated by the Tanner's Council at 54,000,000 square feet, but of which only 35,000,000 square feet was suitable for upholstering automobiles. | |
| Upholstering cloth, yards | 5,357,000 |
| Imitation leather, square feet | 88,400,000 |
| Lumber used in manufacturing cars and trucks, feet | 313,800,000 |
| Glass (mostly plate glass), square feet | 16,500,000 |
| Production of plate glass, 1921, approximately | 55,000,000 |
| Per cent. used in manufacturing cars and trucks | 30% |
| Top and side curtain material, yards | 15,330,000 |
| Hair and padding, pounds | 16,000,000 |
| Paint and Varnish, gallons | 5,900,000 |

the Automobile Club of America. The Southern California club has long been the leader in the Far West in the work for good roads and the development of motor touring along comfortable lines. The club states that there are many inquiries on the Pacific coast from motorists who are preparing to point their automobiles toward the Atlantic.

A letter addressed to the Touring Bureau of the Automobile Club of Southern California, Los Angeles, will give inquirers accurate information as to the route; and once reaching Omaha, the club signs will guide the traveler straight through to Los Angeles.

Parties contemplating camping out along the way are advised to prepare themselves carefully for all emergencies by carrying a small supply of canned goods, fruit, crackers, tea and coffee, sugar, condensed milk and sardines. Take warm clothing and blankets and sleeping bags. Sun goggles such as are used by racing drivers are best for use in the desert driving. A good stock of automobile accessories, an axe and a long-handled shovel should also be taken. Motorists are cautioned about drinking alkali water. If in doubt, boil it before drinking. Take a few simple medical remedies and something for chapped lips and hands. Build small fires and extinguish them carefully before breaking camp. Wear stout gloves for driving.

The entire expense of the trip, it is stated, should not exceed \$5 a day per passenger. By traveling 10 hours a day and averaging 18 miles an hour, the trip can be made either way in approximately five weeks. Another bit of advice for those new to the trip is not to ford any stream without testing the depth and ascertaining the texture of the bottom. Go slowly into the current under low gear, and do not try to rush a ford, as this is likely to flood the carburetor and stop the engine.

All of the counties in California have automobile camps, which give many conveniences to motorists. The cost is nominal, from 50 to 25 cents a day.

Road Maps.

NEW YORK, July 9.—Every motorist knows the value of a good road map when touring. To be of real use, such a map should be accurate, up-to-date and sufficiently large to permit the delineation of all necessary details in the region covered. Printing maps in two or more colors often adds materially to the value of the finished product, while the use of strong bond or ledger paper is almost essential with road maps that are certain to be subjected to hard usage on the road.

An exceedingly large variety of these maps is available this season, embracing everything from a transcontinental map, showing all of the principal routes for cross-country traffic, to a series of long, narrow strip maps, each of them depicting full details, with mileages, for a single, well travelled trunk route, such as the Boston Post Road. All of the states in the east are covered by detail maps, that of New York in particular be-

| Annual Production of Motor Vehicles | | | | | |
|-------------------------------------|-----------|-----------------|---------------|-----------|-----------------|
| Passenger and Commercial Combined. | | | | | |
| Year | Number | Wholesale Value | Year | Number | Wholesale Value |
| *1899... | 3,700 | \$4,750,000 | 1912... | 356,000 | 335,000,000 |
| 1903... | 11,000 | 12,650,000 | 1913... | 461,500 | 399,902,000 |
| *1904... | 21,975 | 30,864,616 | *1914... | 543,679 | 413,859,379 |
| 1905... | 25,000 | 40,000,000 | 1915... | 818,618 | 565,978,950 |
| 1906... | 34,000 | 62,900,000 | 1916... | 1,493,617 | 797,469,353 |
| 1908... | 65,000 | 137,800,000 | †1917... | 1,740,792 | 1,053,505,781 |
| *1909... | 127,731 | 165,148,529 | †1918... | 926,388 | 801,937,925 |
| 1910... | 187,000 | 225,000,000 | 1919... | 1,657,652 | 1,461,785,925 |
| 1911... | 210,000 | 262,500,000 | 1920... | 1,883,158 | 1,809,170,963 |
| 1912... | 378,000 | \$378,000,000 | 1921... | 1,514,000 | 1,093,918,000 |
| 1913... | 485,000 | 425,000,000 | Motor Trucks. | | |
| *1914... | 569,045 | 458,957,843 | *1904... | 411 | \$946,947 |
| 1915... | 892,618 | 691,778,950 | *1909... | 3,255 | 5,230,023 |
| 1916... | 1,583,617 | 954,969,353 | 1903 to 1910 | 10,374 | 20,485,500 |
| †1917... | 1,868,947 | 1,274,488,449 | 1911... | 10,655 | 22,292,321 |
| †1918... | 1,153,637 | 1,236,106,917 | 1912... | 22,000 | 43,000,000 |
| 1919... | 1,974,016 | 1,885,112,546 | 1913... | 23,500 | 44,000,000 |
| 1920... | 2,205,197 | 2,232,927,628 | *1914... | 25,375 | 45,098,464 |
| 1921... | 1,668,550 | 1,260,000,000 | 1915... | 74,000 | 125,800,000 |
| Passenger Cars. | | | 1916... | 90,000 | 157,500,000 |
| *1899... | 3,700 | \$4,750,000 | †1917... | 128,157 | 220,982,668 |
| *1904... | 21,281 | 23,634,367 | †1918... | 227,250 | 434,168,992 |
| *1909... | 127,731 | 159,918,506 | 1919... | 316,364 | 423,326,621 |
| 1910... | 181,000 | 213,000,000 | 1920... | 322,039 | 423,756,715 |
| 1911... | 199,319 | 240,770,000 | 1921... | 154,550 | 166,082,000 |

*From U. S. Census reports.

†Production figures compiled by Automotive Products Section, War Industries Board, from sworn statements by manufacturers.

ing exceptionally complete and attractive.

Not only does this map show all the roads that are fit for automobile traffic, but, also, it is printed in colors to correspond to the color-band system that has proven so popular with motorists in that region. Another new feature, which makes this particular map invaluable to motorists, is that which involves the location of all the camping sites that have been established so far in the Adirondacks, the Catskills and other sections of the Empire State.

The map of New Jersey is another which will, undoubtedly, find favor with many thousands of motorists in New York city and vicinity. This has also been printed in colors to distinguish between different types of road surface, such as concrete, macadam, gravel and dirt. Moreover, it likewise indicates those trunk routes in New Jersey that have been numbered by the State Highway Department.

So many good roads are found on Long Island, southern Westchester and suburban New Jersey that it has been deemed advisable to issue large scale maps of both Long Island and the metropolitan district. These show the location of all streets and roads that are best suited for automobile traffic as well as golf and country clubs, parks, cemeteries and important landmarks.

A complete list of all the maps published by this well known organization of motor car owners may be secured upon application to the American Automobile Association at 501 Fifth Avenue.

Rail Cars.

NEW YORK, July 10.—Nearly \$14,000 annually will be saved by the Union Transportation Company of New Jersey through the substitution of motor rail car equipment for its steam locomotive and coaches. This new equipment will be used on the company's run from Hightstown, N. J., where it connects with the Amboy division of the Pennsylvania railroad, to Pemberton, the southern terminus, where connection is made with the main line of the Pennsylvania railroad.

It is also reported that the use of such equipment by the Narragansett Pier Railroad of Rhode Island has increased the patronage of the company's lines from a monthly average of 10,000 passengers to 26,000. This is a new high water mark for the company.

Other railroads that have recently made similar installations of motor rail equipment are the New York, New Haven & Hartford, Great Northern, Cleveland, Cincinnati, Chicago & St. Louis, Baltimore & Ohio, Central West Virginia & Southern, Gilmore & Pittsburgh, Pittsburgh & Susquehanna and New Mexico Central. In all there are about 35 railroads using the equipment.

The equipment may be used for other purposes besides the transportation of passengers. With a suitably designed body it may be used for carrying freight, baggage or mail. On a level track a speed of 25 to 28 miles per hour can be attained, the newest addition to the Narragansett Pier road making 48 miles.

Touring with the Motor Car

A Story Written to Aid the Tourist in Properly Servicing the Automobile Before Starting the Trip, Detailing Methods Which May Be Used in Emergencies.

EACH SUCCEEDING year the touring season brings many thousands of new devotees to the sport and pleasure offered by the great outdoors. Many of these new-comers join the ranks of sea shore admirers, while others seek one of the myriad beauty spots in the interior sections of the country.

The modern motor vehicle, highly perfected and efficient, does not require a mechanic to operate it, but

the tourist should always have an elementary knowledge of methods to be used in emergencies that may occur. In the writer's opinion, the human being who first uttered that oft repeated saying, "An ounce of prevention is worth a pound of cure", made a singularly wise and truthful statement. It is certainly very applicable to the automobilist contemplating on a tour, as many of our readers will testify.

TO ADEQUATELY prepare the car for the road, a thorough examination should be conducted. All grease cups should be replenished and screwed down. If the part being lubricated takes the entire cupful, ascertain if the grease is oozing out of the bearing at any point. If no signs of the grease appear, refill the cup again in

fective from rim cuts, stone bruises or cuts, they should be repaired before starting on the journey. A small vulcanizer is a splendid thing to have in the tool kit—it will experience no ill effects from your not having to use it on the trip—and it may come in mighty handy. Rims and clamping bolts should be thoroughly cleaned and oiled, aiding their

Full Set of Tools Essential.

Even if a person is not adept in the art of using mechanical tools, the kit of any motor car should be well stocked. Many times an owner has had to pay for the time of a repairman, back and forth from his garage, in order to obtain some tool or appliance. This trip would have been saved if the tool-kit of the machine had been properly packed and kept up.

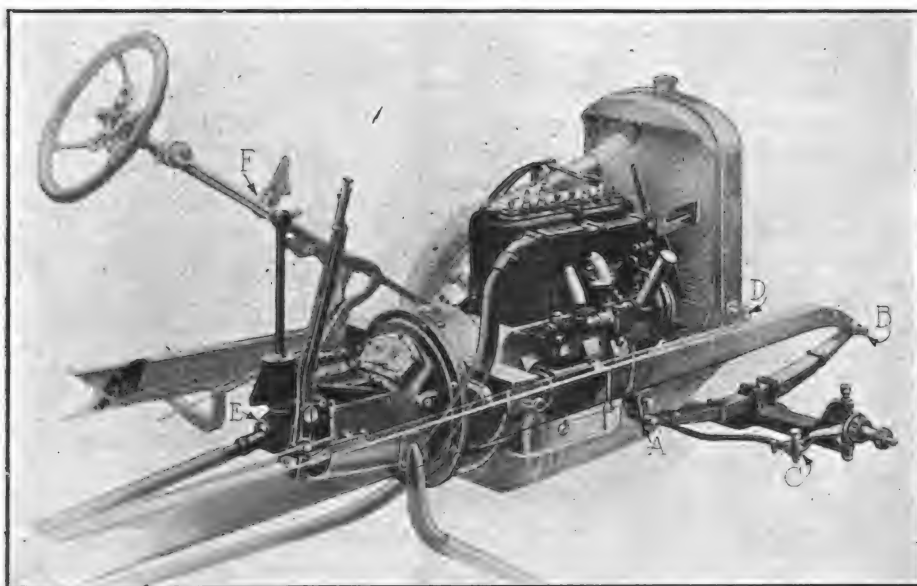
It is rather an embarrassing situation for the owner of a nice car to be placed in, if he calls on another motorist for the use of a monkey wrench or screw driver that he should have himself. For that matter it is equally as bad to be called upon to loan one to another motorist and have to admit you haven't got one.

The writer was once enabled to lend aid to a motorist whose engine refused to function. When asked how it acted before it actually stopped, the operator said it had been running nicely. He had expended practically an hour in cranking and priming to no avail. It was plainly seen by looking at the carburetor that the car had gas, so the owner was asked for a screw driver to try the spark.

He looked rather guilty as he said "I just got this car from the garage and they didn't leave even so much as a screw-driver in it. I had some dandy tools, too." He was next asked for a spark plug wrench. He looked vacantly about for a brief period, then said "A wrench, oh, yes, I think I've got one of those," and he made a wild lunge at the front seat cushion. Such a collection as came tumbling to the running board of the car! Old waste, greasy rags, nails, spikes, screws, broken drills, useless bolts and nuts; an "S" wrench with one of the lips broken, an empty bottle marked "Rum", and, finally, a rusty and much battered 12 inch Stillson wrench.

The smile of triumph which he wore was really so genuine I couldn't find it in my heart to say what I was thinking, so I merely suggested that perhaps my tool-kit had one that would be more suited to the task at hand.

The car owner should not court a similar situation, but, instead, the car should be equipped with a good set of "S" wrenches, an eight and 10 inch monkey



A, B—Spring Shackle Grease Cups; Keep Filled with Cup Grease and Turn Down Often. C—Tie Rod Forked End; Keep Tight and the Cup Filled with Grease to Supply Sufficient Lubrication. D—Radiator Bolt; Keep Tight to Avoid Rattle. E—Universal Joint Rear of Transmission; Supply Sufficient Lubricant Through Cup if Provided, if Not by Keeping the Proper Level in Transmission Case. F—Steering Post Bracket at Dash; Keep All Screws Tight, Otherwise Noise Will Develop.

order to make certain that the bearing receives the lubricant. Wheel caps and hubs should be examined and well greased, and the spring leaves separated from each other by a coating of graphite and oil. It is a very good plan to fill a small covered can with grease and place it in the car together with emergency containers for gasoline and oil. Many motorists always use a certain make and grade of oil in the engine of their car. This is a decidedly good policy and for that reason a supply should be carried on long stages from one dealer in this make of oil to another.

If any tires on the machine are de-

removal, if this becomes necessary. These parts of a car are often overlooked by the car owner, who equips the car with a new set of tires in the spring and then forgets that his car has such things as rims and clamp bolts until he has to change a tire.

A slight amount of attention given to these parts more than pays for the efforts expended. The reader, undoubtedly, has observed many autoists changing tires that were badly stuck to the rims by a heavy formation of rust, dirt and scale. This condition could be easily averted if a coating of rim paint had been applied and the clamp bolts oiled.

wrench or adjustable wrenches of other types, good assortment of screw drivers, at least two hammers, small and medium size hack saw, various sized punches, files, a small hand drill and the bits to fit it.

Care of Accessories.

The accessories of the car should all be examined and accounted for before

car acts in the same capacity on the electric system as the safety valve on a steam boiler, for it prevents the overloading of the system, which otherwise might take place in case of unit derangement. It is also a good indicator of grounds in the system and protects the wiring from damage. If a fuse, having a three ampere capacity, has been installed

direction, the lights should be burned during the day to use up some of the electrical energy. Excessive charging of the battery will cause the plates to become heated and, perhaps, warped which causes a short-lived battery.

The cooling water system of the car should be flushed out, the fan belt tightened, if necessary, and the radiator core cleaned thoroughly with a hose, when this operation is being performed, the stream from the hose should always be directed from the engine side; for, by playing the hose on the front of the radiator, the entire engine will be wet down, the electrical units included.

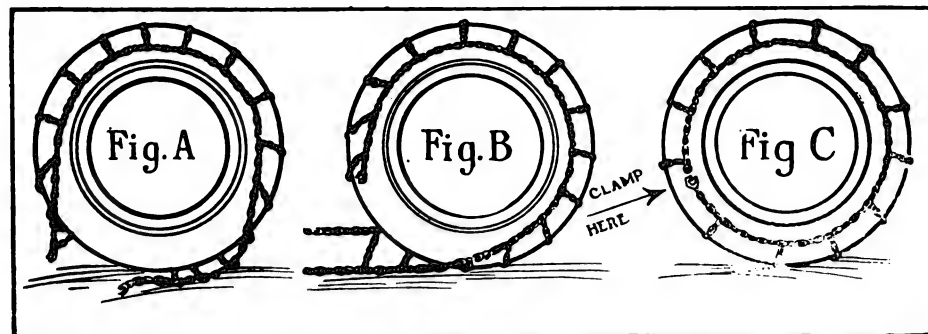
The best medium to use in the cooling system of an automobile is rain water, although this fact appears to be known to only a few. This contains no acid contents and is slightly alkaline which prevents pitting and also prevents electrolytic action to a slight extent. The motorist, who desires to keep his car in the best of condition, would do well to remember this point as the water from many parts of the country is high in chlorine content and causes corrosion in the cooling system of the car.

On the Road.

After the trip has started, the driver of the car should endeavor to: 1, obtain the greatest amount of economy in operating expense; 2, save both the engine and tires from undue wear.

It is a great help to the engine if a suitable speed is determined beforehand, and speed of the engine kept as closely to this limit as circumstances will allow. An engine having flexible qualities is greatly to be desired, in the opinion of the writer, but the practice of travelling along at 10 miles an hour and then speeding up to 35, in the shortest distance possible, is extremely hard on any engine. For this reason, as well as for the safety of the people on the road, choose a safe speed limit and stick to it.

When travelling down grades that are not steep enough to warrant using the



AN EASY WAY TO PUT ON CHAINS. A—Chain Draped Loosely Over Wheel. B—Car Rolled Ahead a Short Distance. C—Ends Easily Clamped in This Position.

the trip is started. The tire pump, car jack, tow-line, wheel spanner, vulcanizer, extra lamp bulbs (to fit each of the light sockets), spare inner tubes, patches, tape, binding wire and tire chains should all be nicely packed in the well equipped car. The skid preventing chains are a necessary adjunct to any car, but it is remarkable the number of car owners who seldom if ever use them, and the number of others who make a very hard job of placing them on the tires.

The best method to use in applying these accessories is to drape each one over the wheel loosely, then roll the car ahead a few feet over one end of the chain after which the clamps can be easily fastened.

Many times I have seen the car owners pushing and pulling the car in an endeavor to roll it onto a chain that had been spread out flat on the ground, then, after the car had travelled the proper distance, it was found the chain was cramped, or the tire stood directly on the side retaining chain preventing the fastening of the two ends, and necessitated some more pushing and pulling.

Attention should also be given to the care and preservation of these chains. After being used, they should not be thrown into a corner until wanted again; instead, they should be allowed to dry thoroughly and the clamps liberally coated with vaseline or good grease which will prevent any corrosive action from taking place. A very good method used by some motorists consists of a moisture proof bag into which the chains are placed after being dried and greased. This bag is then rolled up, fastened and carefully stored away under the rear seat until the chains are needed again.

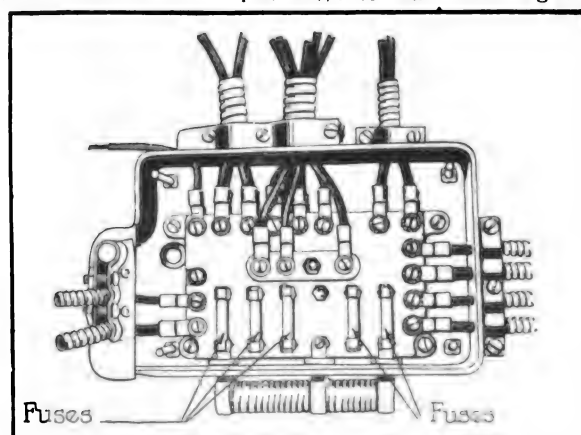
The motorist should also procure a few extra fuses of the proper amperage to fit the electrical system of his car. The fuse in the electric system of a car is placed there for a real reason and the practice, employed by many owners and some garage men, of wiring the two terminals of the fuse receptacle together is a decidedly bad procedure, unless the repair is for a short period only. The fuse block of a

in the fuse block—that is the size that should be used for replacement purposes. If this size fuse keeps continually burning out, it is a sure indication that the car needs the attention of a service man.

A small, but varied assortment of nuts, lock-washers and cotter-pins should also be part of the car equipment. These should not be thrown in a tin box haphazardly, but, instead, they should be strung on a piece of fine wire and the ends looped together. If the occasion should arise for the use of a 5/16 or a 3/8 inch nut, this eliminates the usual method of poking over the whole assortment, as the wire is merely taken out, the nut wanted readily found and the entire procedure greatly simplified.

The condition of the battery should also be ascertained by the use of a voltmeter or the hydrometer. If it shows a low state of efficiency, it should be given a charge from some outside source. The water should be replenished to com-

Extra Fuses of the Proper Amperage Should Always Be Carried by the Motorist on Long Tours, for It Sometimes Is Hard to Procure These Parts in Vicinities Not Having Well Equipped Motor Repair Shops.



pletely cover the tops of the elements with a small bottle of distilled water placed in the car for use on the trip. The battery of the car usually is subjected to severe usage on a tour and, for this reason, the motorist should endeavor to have it at its highest efficiency before the trip is started.

If, in the course of touring, most of the driving is done in the day time, the battery should be watched for overcharging, and, if any tendency is shown in this

and fuel will be saved by drawing out the clutch and throwing off the ignition; upon reaching a level stretch, the ignition is turned on again and the clutch re-engaged, which causes the engine to start once more. When about to descend a very steep hill, the braking power of the engine should be used. Usually the second gear is found sufficient for supplying all the braking power required.

(Continued on Page 42.)

A Word of Explanation



THE following 18 pages are devoted to the more popular automobile routes throughout the eastern states, together with a map of the United States, on which are shown the main transcontinental trails. All maps, of which there are several, are properly marked in a way that will make it easy for the motorist to locate the routes of interest, while distances are given in accompanying tables, all of which should simplify the problems of the tourist.

To make it convenient to look up any of the more popular routes or distances between important points, the following index has been prepared:

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NEW ENGLAND ROUTES

NEW YORK TO BOSTON VIA NEW HAVEN.

New York-New Haven.

| Miles | Miles |
|----------------------|----------------------|
| New York..... 0.0 | Norwalk 43.7 |
| New Rochelle... 18.0 | Westport 47.0 |
| Larchmont..... 19.8 | Southport 51.3 |
| Mamaroneck... 21.4 | Fairfield 52.8 |
| Rye..... 25.2 | Bridgeport 57.5 |
| Portchester... 26.9 | Stratford 61.1 |
| Greenwich..... 29.8 | Millford 65.7 |
| Stamford..... 35.0 | New Haven.... 75.0 |
| Darien..... 39.2 | |

| | |
|----------------------|----------------------|
| North Attleboro 12.3 | Dedham 34.2 |
| Plainville..... 14.0 | Forest Hills... 38.7 |
| Wampum..... 17.4 | Boston 44.2 |
| Wrentham..... 18.9 | |

NEW HAVEN TO BOSTON VIA SPRINGFIELD.

New Haven-Hartford.

| Miles | Miles |
|---------------------|---------------------|
| New Haven.... 0.0 | Meriden 19.9 |
| North Haven... 8.1 | Berlin 26.1 |
| Wallingford... 13.5 | Hartford 37.1 |

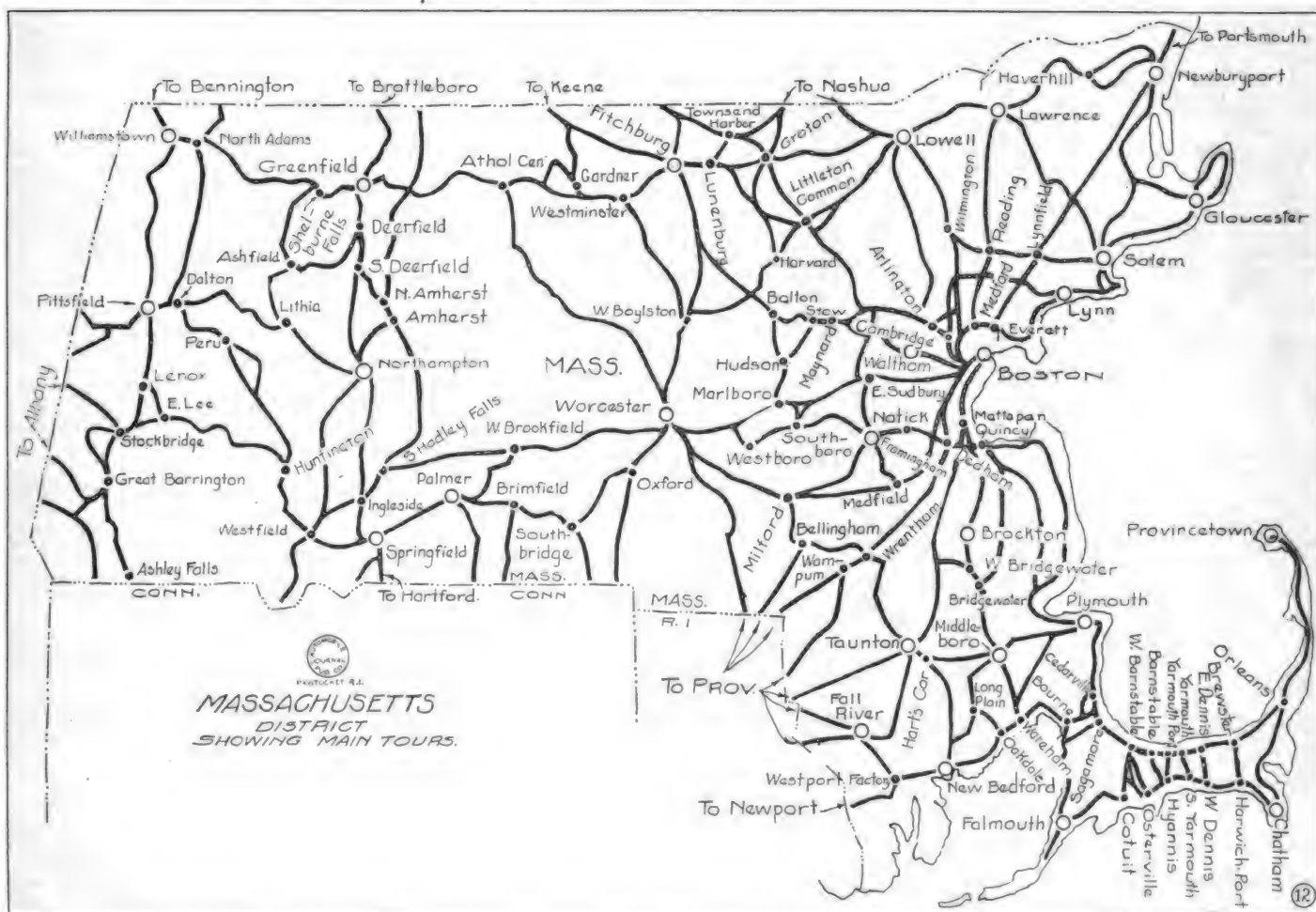
NEW YORK TO DANBURY AND POINTS IN CONNECTICUT.

New York-Danbury.

| Miles | Miles |
|----------------------|-----------------------|
| New York..... 0.0 | Cross River.... 44.3 |
| White Plains... 23.4 | South Salem... 48.5 |
| Armonk..... 31.3 | Ridgefield 52.5 |
| Bedford..... 39.3 | Danbury 62.0 |

Danbury-New Haven.

| Miles | Miles |
|-------------------|---------------------|
| Danbury..... 0.0 | Huntington ... 21.0 |
| Bethel..... 3.4 | Shelton 24.6 |
| Dodgingtown.. 6.5 | Derby 24.9 |



New Haven-New London.

| Miles | Miles |
|--------------------|---------------------|
| East Haven.... 4.5 | Westbrook 29.2 |
| Brandford..... 7.5 | Saybrook 33.4 |
| Gilford..... 16.1 | Lyme 36.7 |
| Madison..... 21.0 | Flanders 46.0 |
| Clinton..... 24.9 | New London... 52.8 |

New London-Providence.

| Miles | Miles |
|---------------------|----------------------|
| New London.... 0.0 | Wakefield 36.6 |
| Groton..... 1.1 | Narragansett... 41.2 |
| Mystic..... 7.7 | Wickford 52.9 |
| Stonington.... 10.7 | East Greenwich 60.3 |
| Westerly..... 17.0 | Apponaug 62.7 |
| Charlestown... 28.8 | Providence 72.7 |

Providence-Boston.

| Miles | Miles |
|---------------------|--------------------|
| Providence..... 0.0 | Walpole 25.7 |
| Pawtucket..... 4.3 | Norwood 30.0 |

Hartford-Springfield.

| Miles | Miles |
|---------------------|----------------------|
| Hartford..... 0.0 | Thompsonville.. 18.6 |
| East Hartford.. 1.9 | Long Meadow... 22.2 |
| Warehouse Pt.. 13.4 | Springfield... 24.7 |
| Enfield..... 17.5 | |

Springfield-Worcester.

| Miles | Miles |
|----------------------|-----------------------|
| Springfield.... 0.0 | Brookfield 32.9 |
| N. Wilbraham.. 9.6 | E. Brookfield... 36.3 |
| Palmer..... 15.7 | Spencer 39.4 |
| West Warren... 24.0 | Leicester 44.3 |
| Warren..... 26.5 | Worcester 50.5 |
| W. Brookfield.. 30.2 | |

Worcester-Boston.

| Miles | Miles |
|--------------------|---------------------|
| Worcester..... 0.0 | South Sudbury. 23.0 |
| Shrewsbury.... 5.5 | Wayland 26.2 |
| Northboro.... 10.0 | Weston 29.7 |
| Marlboro..... 15.8 | Boston 43.5 |

| | |
|-------------------|--------------------|
| Stepney..... 14.7 | New Haven.... 34.5 |
|-------------------|--------------------|

Danbury-Bridgeport.

| Miles | Miles |
|------------------|----------------------|
| Danbury..... 0.0 | Red Ridge..... 10.4 |
| Bethel..... 3.4 | Eunton 16.3 |
| Redding..... 8.5 | Bridgeport 25.5 |

Danbury-Waterbury.

| Miles | Miles |
|--------------------|----------------------|
| Danbury..... 0.0 | Southbury 17.0 |
| Newtown..... 9.2 | Middlebury 26.9 |
| Sandy Hook... 10.7 | Waterbury 31.6 |

Danbury-Norwalk.

| Miles | Miles |
|---------------------|--------------------|
| Danbury..... 0.0 | Norwalk 23.1 |
| Branchville... 10.5 | |

Danbury-Stamford.

| Miles | Miles |
|--------------------|----------------------|
| Danbury..... 0.0 | Glenbrook 26.6 |
| Lewislboro... 13.8 | Stamford 29.5 |
| New Canaan... 20.7 | |

Waterbury-Hartford.

| Miles | Miles |
|----------------------|-----------------------|
| Waterbury..... 0.0 | Plainville 16.7 |
| Marion..... 6.7 | Farmington ... 21.3 |
| Milddale..... 8.1 | Hartford 30.4 |
| Southington.... 11.9 | |

**NEW YORK TO WHITE MOUNTAINS
VIA GREENFIELD.****New York-Pittsfield.**

| Miles | Miles |
|----------------------|------------------------|
| New York..... 0.0 | Wassale 90.0 |
| Yonkers..... 14.0 | Amenia 93.5 |
| Dobbs Ferry... 19.2 | Millerton 102.5 |
| Tarrytown.... 24.2 | Lakeville 106.4 |
| Briarcliff..... 30.9 | Salisbury 107.9 |
| Yorktown H'ths 41.6 | S. Egremont... 121.4 |
| Carmel..... 57.4 | Great Bar'gton 125.0 |
| Patterson..... 65.8 | Stockbridge... 132.4 |
| Pawling..... 70.5 | Lenox 138.3 |
| South Dover... 78.3 | Pittsfield 145.0 |

| | |
|---------------------|---------------------|
| Orford..... 22.3 | Bethlehem 67.2 |
| Piermont..... 28.3 | White Mts. |
| Haverhill..... 33.5 | (Twin Mtn. H. 75.5) |

**NEW YORK TO WHITE MOUNTAINS
VIA BURLINGTON.****Pittsfield-Rutland.**

| Miles | Miles |
|---------------------|---------------------|
| Pittsfield..... 0.0 | Manchester ... 58.5 |
| Lanesboro..... 5.3 | Manchester C. 59.8 |
| Williamstown.. 21.5 | E. Dorset..... 65.1 |
| Bennington... 35.5 | Danby 72.8 |
| Shaftsbury... 43.2 | Wallingford... 82.1 |
| Arlington..... 50.4 | Rutland 92.5 |

Pittsfield-Keene.

| Miles | Miles |
|---------------------|----------------------|
| Pittsfield..... 0.0 | Stamford 28.5 |
| Cheshire..... 10.7 | Heartwell, V. 34.1 |
| Adams..... 15.8 | Searsburg 40.2 |
| North Adams.. 22.0 | Keene 86.0 |

OPTIONAL ROUTES.**Rutland-White River Junction.**

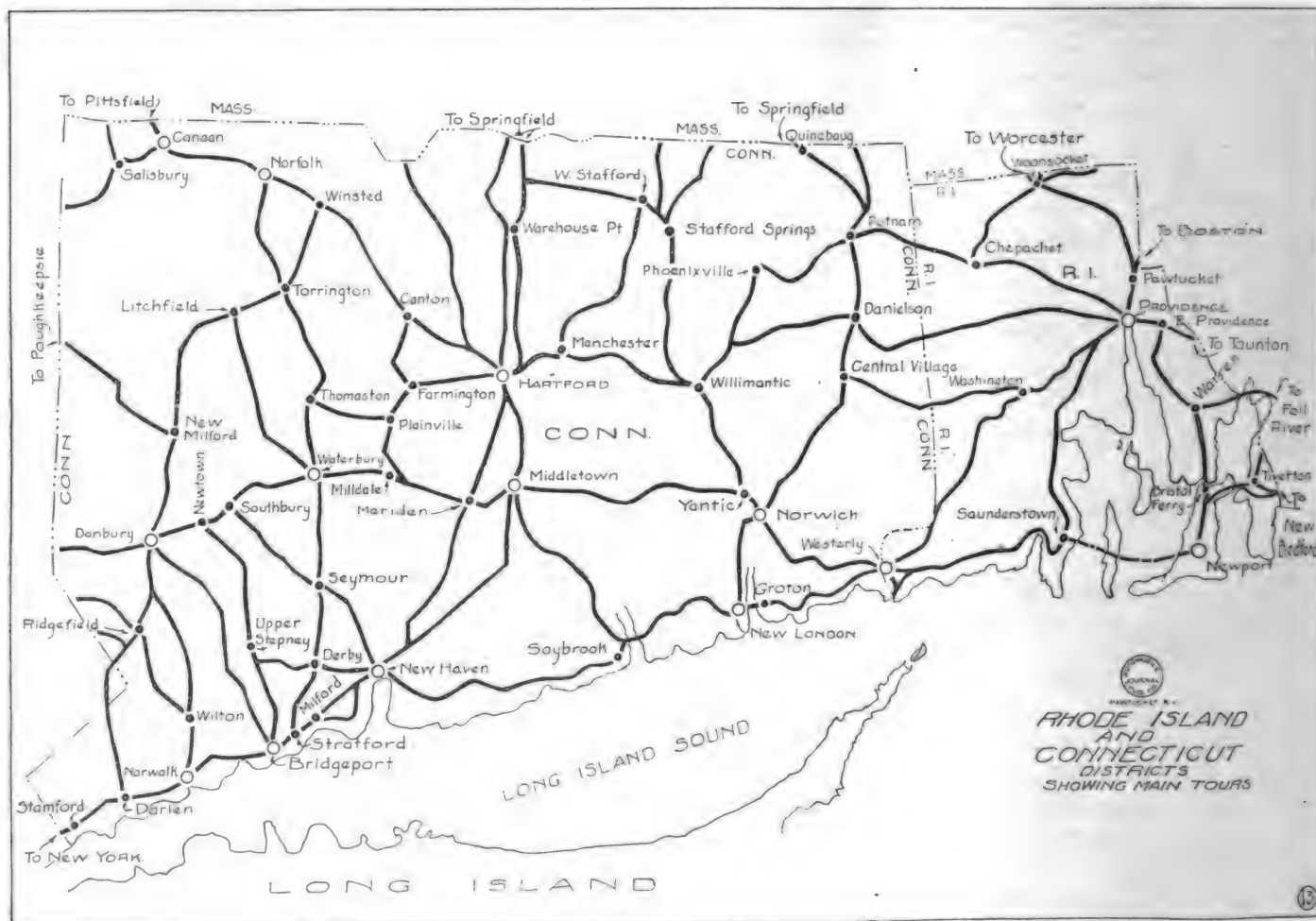
| Miles | Miles |
|---------------------|-----------------------|
| Rutland..... 0.0 | Bridgewater ... 25.3 |
| Mendon..... 4.2 | Woodstock ... 31.7 |
| Sherburne..... 13.4 | Taftsville 35.0 |
| W. Bridgewater 17.7 | Quechee 38.6 |
| Bridgew'r Crs. 23.7 | W. R. Junction 45.0 |

Rutland-Lake George.

| Miles | Miles |
|---------------------|----------------------|
| Rutland..... 0.0 | Comstock 33.4 |
| W. Rutland.... 3.7 | Fort Ann..... 37.4 |
| Castleton..... 11.0 | Hudson Falls.. 46.4 |
| Castleton Crs. 12.6 | Gleens Falls... 50.0 |
| Fair Haven.... 16.0 | Lake George... 59.0 |
| White Hall.... 26.2 | |

BOSTON TO WHITE MOUNTAINS.**Boston-Concord.**

| Miles | Miles |
|-----------------|-------------------|
| Boston..... 0.0 | Nashua 43.5 |

**Pittsfield-Greenfield.**

| Miles | Miles |
|---------------------|----------------------|
| Pittsfield..... 0.0 | Goshen 30.5 |
| Dalton..... 6.4 | Williamsburg.. 36.3 |
| Windsor..... 12.5 | Haydenville... 38.6 |
| Cummington... 24.2 | Northampton.. 44.5 |
| Lithia..... 28.6 | Greenfield 64.5 |

Greenfield-White River Junction.

| Miles | Miles |
|---------------------|----------------------|
| Greenfield..... 0.0 | Charlestown... 51.5 |
| Barnardston... 6.0 | Claremont..... 62.5 |
| Guliford..... 17.6 | W. Claremont.. 65.2 |
| Brattleboro... 20.5 | Ascutneyville.. 67.4 |
| Putney..... 30.0 | Windsor 72.6 |
| Westminster... 38.6 | Hartland 77.4 |
| Bellevue Falls 44.0 | W. River June. 87.5 |

White River Junction-White Mountains.

| Miles | Miles |
|--------------------|----------------------|
| W. River June. 0.0 | Woodsville 44.7 |
| W. Lebanon.... 0.6 | Bath 45.9 |
| Hanover..... 4.5 | Lisbon 51.6 |
| Lyme..... 15.2 | Littleton 62.3 |

Pittsfield-Burlington.

| Miles | Miles |
|----------------------|-----------------------|
| Pittsfield..... 0.0 | Hampton 89.2 |
| Manchester..... 58.5 | Fair Haven.... 94.0 |
| Man. Cen. P. O. 59.8 | Castleton Cor.. 97.0 |
| Dorset..... 66.0 | Hubbardton... 104.1 |
| E. Rupert..... 68.0 | Sudbury 110.4 |
| Pawlet..... 74.5 | Cornwall 122.8 |
| N. Pawlet..... 78.0 | Middlebury 126.5 |
| Wells..... 80.4 | Burlington 161.5 |
| Poultney..... 88.2 | |

Burlington-White Mountains.

| Miles | Miles |
|---------------------|----------------------|
| Burlington..... 0.0 | W. Danville... 65.3 |
| Williston..... 7.8 | Danville 68.2 |
| Richmond..... 12.7 | St. Johnsbury.. 75.5 |
| Waterbury..... 26.5 | Waterford 88.3 |
| Montpelier.... 38.5 | Littleton 93.8 |
| E. Montpelier. 45.5 | Bethlehem 98.9 |
| Plainfield.... 45.6 | White Mts. |
| Marshfield... 55.1 | (Twin M. H.) 107.0 |
| El. Cabot..... 62.0 | |

| | |
|---------------------|----------------------|
| Winchester.... 11.5 | Reeds Ferry... 53.0 |
| Woburn..... 13.7 | Manchester 62.0 |
| Wilmington... 18.9 | Suncook 73.0 |
| Tewksbury.... 24.7 | Pembroke 74.6 |
| Lowell..... 29.5 | Concord 89.5 |
| Tyngaboro.... 37.1 | |

Concord-White Mountains.

| Miles | Miles |
|--------------------|----------------------|
| Concord..... 0.0 | Holderness 50.2 |
| Penncook..... 6.1 | Ashland 54.3 |
| Boscawen..... 8.8 | Plymouth 60.0 |
| Franklin..... 18.5 | Woodstock 77.0 |
| Tilton..... 22.0 | N. Woodstock.. 81.0 |
| Winnisquam... 28.5 | Flue House.... 86.0 |
| Laconia..... 31.3 | Profile House.. 91.0 |
| Lakeport..... 33.0 | White Mtn. |
| Wiers..... 37.5 | (Twin M. H.) 104.5 |
| Meredith..... 42.4 | |

Boston-Portsmouth.

| Miles | Miles |
|---------------------|---------------------|
| Boston..... 0.0 | Rawley 25.3 |
| Revere Beach.. 11.1 | Newbury 43.5 |
| Lynn..... 15.0 | Newburyport .. 48.0 |

| | | | |
|---------------|------|--------------------|------|
| Salem..... | 21.5 | Sallabury..... | 48.6 |
| Beverly..... | 23.1 | Smithtown..... | 51.3 |
| Wenham..... | 28.0 | Hampton Falls..... | 54.2 |
| Hamilton..... | 30.0 | Rye Beach..... | 62.3 |
| Ipswich..... | 34.3 | Portsmouth..... | 73.5 |

Portsmouth-White Mountains.

| Miles | | Miles | |
|------------------|------|--------------------|-------|
| Portsmouth..... | 0.0 | Conway..... | 80.5 |
| Dover..... | 11.5 | N. Conway..... | 86.0 |
| Somersworth..... | 16.3 | Intervale..... | 87.5 |
| Rochester..... | 23.0 | Glen..... | 91.5 |
| Milton..... | 31.0 | Bartlett..... | 98.0 |
| Union..... | 37.0 | Bemis..... | 104.0 |
| Sanborville..... | 42.0 | Crawfd House..... | 112.6 |
| Wakefield..... | 43.0 | Bretton Woods..... | 115.9 |
| Ossipee..... | 53.0 | Fabyans..... | 116.5 |
| W. Ossipee..... | 64.5 | White Mts. | |
| Chocoma..... | 68.5 | (Twin M. H.)..... | 121.0 |

PORTSMOUTH TO WHITE MOUNTAINS VIA POLAND SPRINGS.**Portsmouth-Portland.**

| Miles | | Miles | |
|--------------------|------|--------------------|------|
| Portsmouth | 0.0 | Ogunquit | 19.0 |
| Kittery | 1.1 | Wells | 24.5 |
| York Cor. | 7.6 | Kennebunk | 29.0 |
| York | 8.5 | Biddeford | 38.5 |
| York Harbor . . . | 9.5 | Saco | 39.5 |
| York Beach | 13.2 | Dunstan | 45.1 |
| Cape Neddick . . . | 15.0 | Portland | 54.0 |

Portland-Poland Springs and White Mountains.

| Miles | | Miles | |
|---------------------|------|--------------------|-------|
| Portland..... | 0.0 | Redstone..... | 78.3 |
| Gray..... | 17.0 | N. Conway..... | 81.5 |
| Dry Mills..... | 19.6 | Intervale..... | 83.4 |
| Poland Springs..... | 27.5 | Glen..... | 87.3 |
| Poland..... | 30.5 | Bartlett..... | 93.5 |
| Webbs Mills..... | 39.1 | Bemis..... | 99.5 |
| Cooks Mills..... | 43.0 | Craw'd House..... | 108.1 |
| Naples..... | 46.7 | Bretton Woods..... | 111.4 |
| Bridgton..... | 55.1 | Fabyans..... | 112.0 |
| E. Fryeburg..... | 64.9 | White Mts. | |
| Fryeburg..... | 70.9 | (Twin M. H.) | 116.5 |
| Conway..... | 75.6 | | |

PORTLAND TO FT. KENT VIA BANGOR.**Portland-Rockland.**

| Miles | | Miles | |
|------------------|------|-------------------|------|
| Portland..... | 0.0 | Newcastle..... | 54.1 |
| Yarmouth..... | 11.9 | Damariscotta..... | 54.5 |
| Freeport..... | 11.7 | Waldoboro..... | 64.3 |
| Brunswick..... | 26.5 | West Warren..... | 71.3 |
| Woolwich..... | 35.7 | Thomaston..... | 76.7 |
| Wiscasset..... | 45.0 | Rockland..... | 81.0 |
| N. Edgecomb..... | 46.7 | | |

Rockland-Bangor.

| | Miles | | Miles |
|----------------|-------|-----------------|-------|
| Rockland..... | 0.0 | Stockton | 37.2 |
| Rockport..... | 6.4 | Prospect | 41.7 |
| Camden | 8.0 | Frankfort | 45.7 |
| Northport..... | 19.0 | Hampden | 55.8 |
| Belfast..... | 27.0 | Bangor | 62.0 |
| Searsport..... | 33.0 | | |

Bangor-Houlton.

| Miles | | Miles | |
|----------------|------|----------------|-------|
| Bangor..... | 0.0 | Lincoln..... | 49.0 |
| Orono..... | 8.0 | Matawamkeag.. | 63.0 |
| Oldtown..... | 13.0 | Macwahoc..... | 72.5 |
| Passadumkeag.. | 32.0 | Haynesville... | 92.5 |
| West Enfield.. | 37.0 | Houlton..... | 117.0 |

Houlton-Fort Kent.

| | Miles | | Miles |
|--------------------|-------|-----------------|-------|
| Houlton | 0.0 | North Lenton.. | 60.5 |
| Middleton | 7.3 | Van Buren | 76.2 |
| Monticello | 12.8 | Grand Isle..... | 91.7 |
| Blaine | 26.5 | Madawaska ... | 100.5 |
| Presque Isle | 41.5 | Fort Kent..... | 120.5 |
| Carribou | 54.2 | | |

OPTIONAL TRIPS.**Bangor-Skowhegan.**

| Miles | | Miles | |
|-------------|------|---------------|------|
| Bangor..... | 0.0 | Newport | 26.2 |
| Hermon..... | 7.5 | Palmyra..... | 30.0 |
| Carmel..... | 14.7 | Canaan | 42.5 |
| Etna..... | 18.0 | Skowhegan.... | 51.0 |

Skowhegan-Rangeley.

| | Miles | | Miles |
|---------------------|-------|-----------------|-------|
| Skowhegan.... | 0.0 | Dead River.... | 43.0 |
| Lakewood..... | 5.7 | Flagstaff | 52.1 |
| North Anson... 12.5 | | Stratton | 63.1 |

| | | | |
|---------------------|------|---------------|------|
| N. New Portl'd..... | 21.1 | Rangeley..... | 83.0 |
| Lexington..... | 29.5 | | |

Bar Harbor-Portland.

| Miles | | Miles | |
|--------------------|-------|-----------------|------|
| Bar Harbor.... | 0.0 | Orland | 37.0 |
| Ellsworth..... | 19.8 | Bucksport | 39.7 |
| East Orland.... | 33.3 | Prospect | 40.6 |
| (Via Bangor Route) | | | |
| Portland..... | 166.0 | | |

Portland-Augusta.

| Miles | | Miles | |
|---------------------|------|-----------------|------|
| Portland..... | 0.0 | Lewiston | 33.6 |
| Gray..... | 17.0 | Greene | 42.0 |
| Up. Gloucester..... | 24.5 | Winthrop | 54.5 |
| Danville Junc..... | 27.7 | Manchester..... | 60.6 |
| Auburn | 33.4 | Augusta..... | 65.0 |

Portland-Rangeley.

| Miles | | Miles | |
|---------------------|-------|----------------------|------|
| Portland..... | 0.0 | Howes Corner..... | 50.1 |
| Gray..... | 17.0 | Norlands..... | 55.1 |
| Up. Gloucester..... | 24.5 | Livermore Falls..... | 60.2 |
| Danville Junc..... | 27.7 | North Jay..... | 66.6 |
| Auburn..... | 33.4 | Wilton..... | 69.7 |
| E. Auburn..... | 36.5 | Farmington..... | 77.2 |
| (Via Augusta Route) | | | |
| Rangeley..... | 119.0 | | |

MOOSEHEAD ROUTE VIA AUGUSTA.**Augusta-Moosehead.**

| Miles | | Miles | |
|-----------------------|------|------------------|------|
| Augusta..... | 0.0 | Athens..... | 49.0 |
| Vassalboro..... | 11.7 | Brighton..... | 57.5 |
| Waterville..... | 19.5 | Kingsbury..... | 63.4 |
| Fairfield Centre | 23.0 | Greenville..... | 90.8 |
| Skowhegan.... | 36.0 | Greenville Junc. | 92.5 |
| (Boats to Moosehead.) | | | |

CAPE TRIPS FROM BOSTON.**Boston-Falmouth.**

| Miles | | Miles | |
|---------------------|------|--------------------|------|
| Boston..... | 0.0 | Tremont..... | 48.8 |
| Randolph..... | 15.8 | Wareham..... | 52.0 |
| Avon..... | 18.2 | Onset..... | 56.3 |
| Brockton..... | 22.0 | Bourne..... | 60.5 |
| W. Bridgewater..... | 26.5 | Monument B'ch..... | 62.4 |
| Bridgewater..... | 29.3 | West Falmouth..... | 71.5 |
| Middleboro..... | 37.5 | Falmouth..... | 75.5 |

Falmouth-Chatham.

| | Miles | | Miles |
|-----------------|-------|------------------|-------|
| Falmouth..... | 0.0 | Centreville | 21.2 |
| Waquoit..... | 6.6 | Hyannis | 25.1 |
| Marshpee..... | 11.7 | S. Yarmouth... | 30.6 |
| Santuit..... | 13.6 | S. Harwich..... | 38.3 |
| Marston Mills.. | 15.7 | Chatham | 43.5 |

Chatham-Provincetown.

| Miles | | Miles | |
|--------------|------|-----------------|------|
| Chatham..... | 0.0 | Wellfleet | 22.0 |
| Orleans..... | 9.5 | Truro | 26.7 |
| Eastham..... | 13.0 | Provincetown.. | 36.5 |

Provincetown-Providence.

| | Miles | | Miles |
|----------------------|-------|----------------------|-------|
| Provincetown . . . | 0.0 | Onset | 69.6 |
| Truro | 9.7 | Wareham | 74.0 |
| Wellfleet | 14.5 | Marion | 79.2 |
| Eastham | 23.4 | Mattapoisett . . . | 84.0 |
| Orleans | 27.0 | Fairhaven | 90.0 |
| Brewster | 32.0 | New Bedford . . . | 91.0 |
| Dennis | 39.2 | Westport Ferry's | 97.5 |
| Yarmouth | 42.5 | Fall River | 102.5 |
| Barnstable | 46.5 | Swansea | 109.1 |
| Sandwich | 58.8 | Seekonk | 119.4 |
| W. Sagamore . . . | 61.0 | Providence | 124.0 |

Boston-Plymouth.

| | Miles | | Miles |
|-------------------|-------|---------------------|-------|
| Boston..... | 0.0 | Greenbush..... | 29.6 |
| Forest Hills..... | 5.7 | Marshfield Cen..... | 35.3 |
| Quincy..... | 13.0 | Marshfield..... | 37.7 |
| Hingham..... | 17.3 | Kingston..... | 45.9 |
| Cohasset..... | 23.9 | Plymouth..... | 50.5 |

Boston-Newport, R. I.

| | Miles | | Miles |
|-------------------|-------|-----------------|-------|
| Boston..... | 0.0 | Dighton..... | 41.8 |
| Forest Hills..... | 5.7 | Somerset..... | 45.1 |
| Punkapog..... | 14.0 | Fall River..... | 50.8 |
| Stoughton..... | 19.1 | Tiverton..... | 57.3 |
| Taunton..... | 26.4 | Newport..... | 69.5 |

Providence-Newport, R. I.

| Miles | | Miles | |
|-----------------|------|------------------|------|
| Providence..... | 0.0 | Bristol Ferry... | 16.7 |
| Warren..... | 12.2 | Newport | 28.5 |

Boston-Gloucester, Mass.

| Miles | | Miles | |
|--------------------|------|------------------------|------|
| Boston | 0.0 | Salem | 22.9 |
| Cambridge | 1.6 | Beverly | 25.5 |
| Somerville | 2.6 | Pride's Crossing | 28.8 |
| Everett | 5.4 | Beverly Farms | 29.5 |
| Revere Beach | 10.3 | Manchester | 32.1 |
| Lynn | 15.4 | Magnolia | 35.5 |
| Swampscott | 17.2 | Gloucester | 39.3 |

Around Cape Ann.

| | Miles | | Miles |
|-----------------|-------|------------------|-------|
| Glou'ter, Mass. | 0.0 | Annisquam..... | 11.1 |
| Rockport..... | 4.2 | Riverdale | 12.3 |
| Pigeon Cove.... | 5.9 | Gloucester | 13.8 |
| Ocean View... | 7.6 | | |

Boston-Nantasket Beach, Mass.

| | Miles | | Miles |
|--------------------|-------|-----------------------|-------|
| Boston | 0.0 | Quincy | 14.5 |
| Brookline | 3.2 | North Weymouth | 18.4 |
| Forest Hills | 5.8 | North Cohasset | 23.3 |
| Ashmont | 9.7 | Nantasket Beach | 24.3 |

Boston-Mt. Wachusett, Mass.

| Boston Mt. Wachusett, Mass. | | | |
|-----------------------------|-------|---------------------|-------|
| | Miles | | Miles |
| Boston | 0.0 | Stow | 24.7 |
| Allston | 3.1 | Bolton | 30.5 |
| Watertown | 5.7 | Clinton | 35.7 |
| Beaver Brook | 8.1 | Sterling | 40.6 |
| Waltham | 8.8 | West Sterling | 44.4 |
| Kendal Green | 11.1 | Princeton | 47.7 |
| Waynard | 21.5 | Mt. Wachusett | 52.7 |

Providence, R. I.-Buzzard's Bay, Mass.

| | Miles | | Miles |
|---------------------|-------|---------------------|-------|
| Providence | 0.0 | Tremont | 39.7 |
| Reh'both, Mass. . . | 8.8 | Wareham | 44.6 |
| Taunton | 18.0 | East Wareham . . . | 46.9 |
| Middleboro | 29.3 | Buzzard's Bay . . . | 50.2 |
| S. Middleboro . . . | 35.9 | | |

MOHAWK TRAIL FROM BOSTON.**Boston-Greenfield.**

| | Miles | | Miles |
|------------------------|-------|---------------------|-------|
| Boston | 0.0 | Westminster .. | 54.3 |
| Cambridge | 0.8 | Gardner | 58.8 |
| Lexington | 11.4 | Otter River | 63.4 |
| Concord | 11.5 | Baldwinville... | 64.6 |
| North Acton | 25.0 | Athol | 74.7 |
| Littleton | 27.8 | Orange | 79.7 |
| Littleton Center | 28.6 | Erving | 84.3 |
| Ayer | 34.7 | Millers Falls | 90.6 |
| Lunenburg | 43.0 | Turners Falls | 94.8 |
| Fitchburg | 47.0 | Greenfield | 98.0 |

Greenfield-Albany.

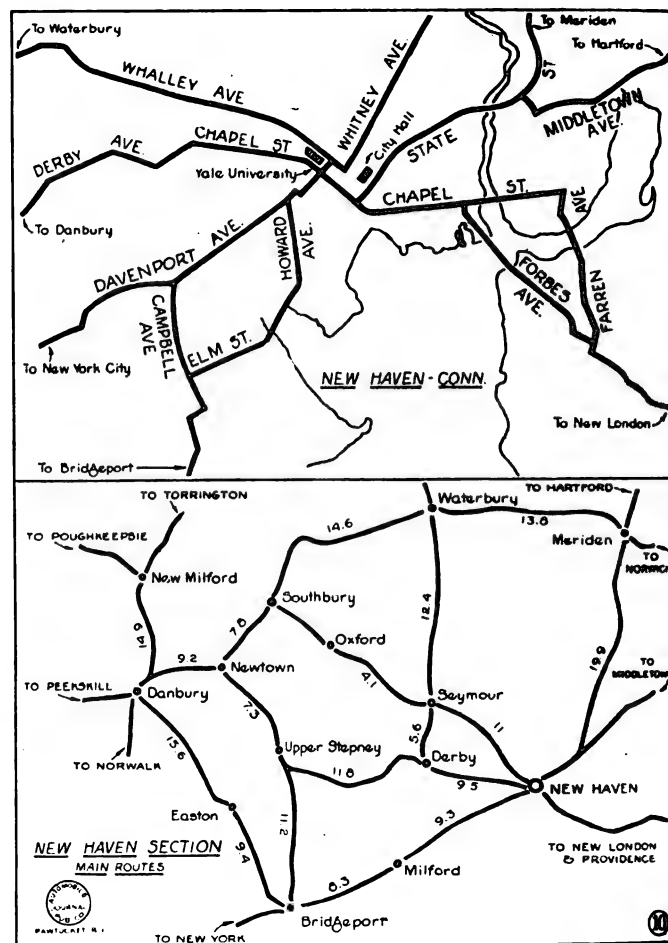
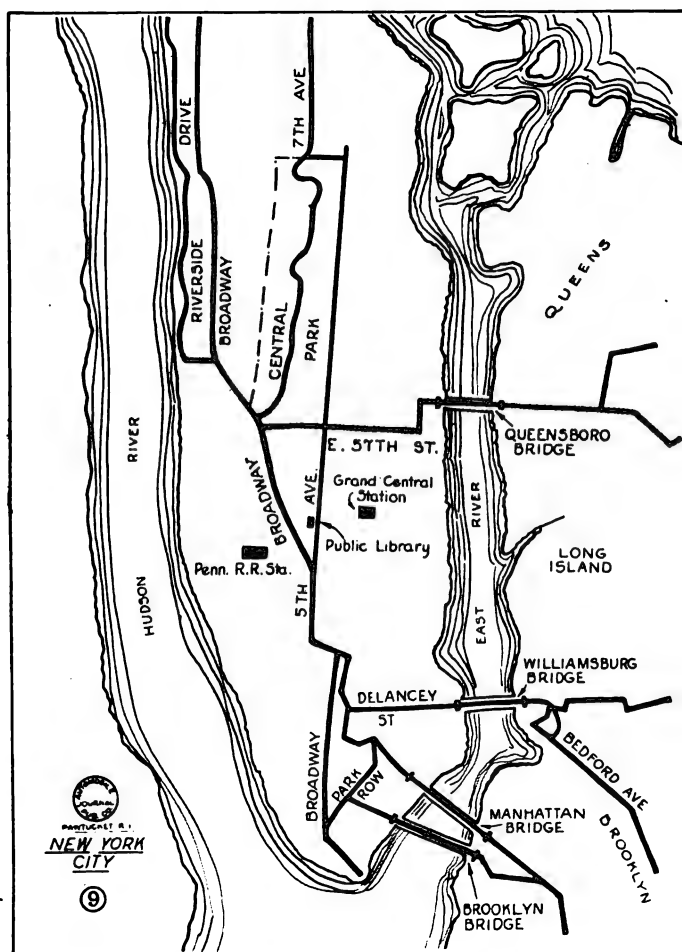
| | Miles | | Miles |
|----------------------|-------|--------------------|-------|
| Greenfield..... | 0.0 | N. Bownal..... | 49.8 |
| Shelburne..... | 5.4 | N. Petersburg..... | 53.5 |
| Shelburne Falls..... | 9.0 | Petersburg..... | 59.0 |
| Charlemont..... | 17.5 | Brunswick Cor..... | 74.7 |
| North Adams..... | 36.5 | Troy..... | 79.5 |
| Williamstown..... | 41.5 | Albany..... | 85.0 |
| Bownal..... | 46.9 | | |

ROUTES TO CANADA.**Burlington-Montreal.**

| | Miles | | Miles |
|-----------------|-------|------------------|-------|
| Burlington..... | 0.0 | Rouses Point.. | 48.5 |
| Winoaki..... | 2.1 | Lacolle | 56.8 |
| Colchester..... | 6.2 | Naperville..... | 64.8 |
| South Hero..... | 18.1 | Douglas Corner | 67.1 |
| Grand Isle..... | 24.5 | St. Jacques..... | 72.8 |
| North Hero..... | 31.1 | Laprairie..... | 85.1 |
| Albany Passage | 36.7 | Montreal | 94.0 |
| Albany..... | 45.1 | | |

Burlington-Newport, Vt.

| Burlington, Newport, &c. | | | |
|--------------------------|------|-------------------|------|
| Miles | | Miles | |
| Burlington..... | 0.0 | Johnson..... | 38.0 |
| Winoaki..... | 2.1 | N. Hyde Park..... | 43.5 |
| Essex Junction..... | 6.5 | Eden..... | 47.6 |
| Essex..... | 9.6 | Lowell..... | 57.7 |
| Jerico..... | 12.9 | Westfield..... | 64.3 |
| Underhill..... | 16.2 | Troy..... | 66.3 |
| Cambridge..... | 26.4 | Newport..... | 77.0 |
| Jeffersonville..... | 29.0 | | |



Newport-Quebec, P. Q.

| Miles | Miles |
|----------------------|-----------------------|
| Newport..... 0.0 | D'Israeli..... 95.5 |
| West Derby..... 0.9 | Colrairie..... 100.9 |
| Derby Line..... 8.2 | Black Lake..... 106.9 |
| Rock Island..... 8.5 | Thetford Mines 111.7 |
| Stanstead..... 9.8 | Robertson..... 117.3 |
| Massawippi..... 22.2 | Broughton..... 123.3 |
| Waterville..... 32.1 | Young Junction 133.2 |
| Lenoxville..... 39.3 | St. Joseph..... 141.1 |
| Sand Hill..... 45.7 | Beauce Junction 146.3 |
| Birchton..... 49.4 | St. Marie..... 152.8 |
| Cookshire..... 52.4 | Scott..... 158.0 |
| Angus..... 58.4 | St. Maxime..... 158.6 |
| Marbleton..... 70.6 | St. Henri..... 172.5 |
| Wedon..... 79.7 | St. Louis..... 177.6 |
| Wedon Lake..... 83.9 | Levis..... 183.0 |
| Garthby..... 90.3 | Quebec..... 183.5 |

Burlington-Richford.

| Miles | Miles |
|----------------------|----------------------|
| Burlington..... 0.0 | Enosburg Falls 51.0 |
| Milton..... 19.6 | Sampsonville... 55.0 |
| Georgia..... 26.2 | East Berkshire 56.2 |
| St. Albans..... 32.1 | Richford..... 60.8 |
| Sheldon Springs 41.8 | |

Richford, Vt.-Quebec.

| Miles | Miles |
|----------------------|------------------------|
| Richford..... 0.0 | Danville..... 72.0 |
| Abercorn..... 3.0 | Warwick..... 83.7 |
| Sutton Flat..... 9.0 | Arthabaska..... 92.0 |
| Sutton Junction 12.0 | Stanford..... 105.0 |
| Brome..... 16.0 | Plessisville... 110.7 |
| Knowlton..... 20.0 | St. Julie..... 120.0 |
| Waterloo..... 30.0 | St. Agathe..... 136.0 |
| Warden..... 37.0 | St. Gilles..... 145.0 |
| Lawrenceville.. 41.0 | Craig's Rd. Sta. 154.0 |
| Racine..... 48.0 | St. Romauld... 170.0 |
| Melbourne..... 60.0 | Levis..... 176.0 |
| Richmond..... 61.0 | Quebec..... 176.5 |

Bangor, Me.-Fredericton, N. B.

| Miles | Miles |
|----------------------|----------------------|
| Bangor..... 0.0 | Sylvan Park.... 92.0 |
| Holden Center.. 6.0 | Machias..... 93.4 |
| Holden..... 8.8 | East Machias... 97.7 |
| N. Ellsworth... 21.0 | Whiting..... 110.1 |
| Ellsworth Falls 26.2 | Dennysville... 119.7 |
| Ellsworth..... 26.8 | West Pembroke 125.1 |
| Wash. Junction 28.9 | Pembroke..... 126.0 |

| | |
|---------------------|--------------------------|
| Hancock..... 36.2 | Bill Cove..... 135.9 |
| Waukeag Sta... 37.1 | Robbinston.... 137.3 |
| W. Sullivan... 37.5 | Red Beach..... 141.1 |
| Sullivan..... 39.2 | Calais..... 149.8 |
| E. Sullivan... 41.9 | St. Steph'n, N. B. 150.3 |
| Ashville..... 43.8 | Mooers Mills... 157.6 |
| Gouldsboro... 45.6 | Honeydale..... 164.0 |
| Steuben..... 53.3 | Lawrence Sta.. 169.1 |
| Millbridge... 58.8 | Low. Brockway 176.8 |
| Cherryfield... 64.3 | York's Mills... 187.4 |
| Harrington... 70.7 | Harvey..... 196.2 |
| Columbia Falls 75.6 | Hammondville.. 211.8 |
| Jonesboro..... 84.0 | Spring Hill.... 222.2 |
| Whitneyville.. 89.6 | Fredericton.... 227.4 |

Augusta, Me.-Quebec, P. Q.

| Miles | Miles |
|----------------------|------------------------|
| Augusta..... 0.0 | Jackman..... 125.6 |
| Sidney..... 8.9 | Moose River... 126.8 |
| N. Sidney..... 12.7 | Interna. Line.. 139.9 |
| Waterville... 19.8 | Armstrong, P. Q. 141.5 |
| Fairfield..... 23.2 | St. Come..... 160.7 |
| E. Fairfield... 30.7 | Jersey Mills... 168.4 |
| Skowhegan... 38.3 | St. George..... 170.1 |
| S. Norrgewock 44.0 | Beauceville... 181.2 |
| Norridgewock 44.4 | St. Joseph..... 190.6 |
| Madison..... 52.7 | Beauce June... 195.9 |
| North Anson... 58.0 | St. Marie..... 202.6 |
| Emaden..... 63.2 | Scott's June... 208.1 |
| Solon..... 66.0 | St. Henri..... 221.7 |
| Bingham..... 74.2 | Levis..... 234.3 |
| Caratunk..... 89.8 | Quebec..... 234.6 |
| The Forks..... 97.6 | |

Calais, Me.-St. John, N. B.

| Miles | Miles |
|------------------------|----------------------|
| Calais..... 0.0 | Musquash..... 64.3 |
| St. Steph's, N. B. 0.4 | Spruce L. Sta.. 74.0 |
| Oak Bay..... 7.0 | Fairville..... 78.9 |
| St. George... 35.8 | St. John..... 81.9 |
| Lepreaux..... 55.7 | |

Houlton, Me.-Woodstock, N. B., 14.7 Miles

| Miles | Miles |
|-------------------|-----------------------|
| Houlton, Me.. 0.0 | Woodstock, N. B. 14.7 |
| Richmond Cor. 7.8 | |

Woodstock-Fredericton, N. B., 63.4 Miles

| Miles | Miles |
|--------------------|----------------------|
| Woods'k, N. B. 0.0 | Prince William. 41.5 |
| Meductic..... 12.8 | Hammondville.. 47.2 |
| Hawshaw..... 26.3 | Fredericton.... 63.4 |

St. John-Fredericton, N. B., 66.6 Miles.

| Miles | Miles |
|----------------------|----------------------|
| St. John, N. B. 0.0 | Welsford..... 24.7 |
| Fairville..... 2.9 | Petersville.... 33.2 |
| Grand Bay.... 10.5 | Oromocto..... 54.2 |
| Westfield B'ch. 14.5 | Fredericton.... 66.6 |

St. John, N. B.-Amherst, N. S., 132.8 Miles.

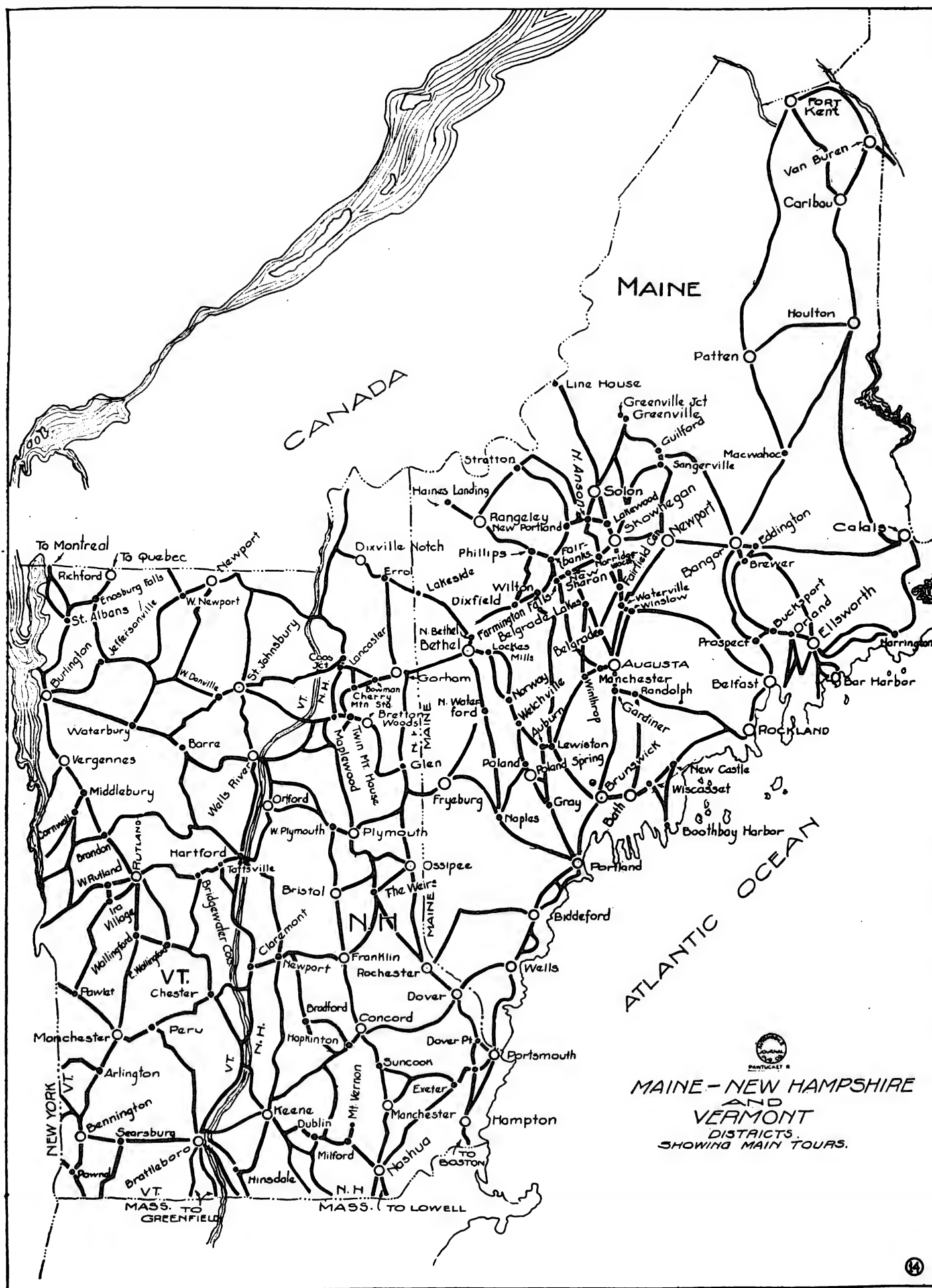
| Miles | Miles |
|---------------------|----------------------|
| St. John, N. B. 0.0 | Pettitcodiac... 68.7 |
| Brookville... 4.7 | River Glade.... 73.9 |
| Terburn Sta.. 5.8 | Salisbury..... 75.8 |
| Riverside Sta.. 7.4 | Boundary Creek 82.1 |
| Rothsay..... 8.9 | Moncton..... 92.5 |
| Nauwigewauk. 17.0 | St. Anselme... 96.8 |
| Lakeside Sta.. 20.9 | Memramcook... 104.3 |

Amherst-Truro, N. S., 92.4 Miles.

| Miles | Miles |
|----------------------|----------------------|
| Amherst, N. S. 0.0 | Lower Economy. 53.6 |
| Nappan Sta... 6.4 | Economy..... 57.7 |
| Maccan..... 9.9 | Bass River..... 64.9 |
| Athol..... 13.8 | Portaplique... 68.2 |
| Westbrook... 23.2 | Great Village.. 74.8 |
| Parrsboro... 35.5 | Glenholme..... 75.2 |
| Moose River... 43.8 | Masstown..... 81.1 |
| Low. Five Is'ls 47.6 | Lower Onslow.. 85.8 |
| Five Islands.. 50.7 | Truro..... 92.4 |

Truro-New Glasgow, N. S., 40.6 Miles.

| Miles | Miles |
|---------------------|----------------------|
| Truro, N. S. 0.0 | Green Hill..... 31.3 |
| Kempton..... 12.9 | Alma..... 33.9 |
| Salt Spring... 24.9 | New Glasgow... 40.6 |



THE TRANSCONTINENTAL ROUTES

ITINERARY.

The Lincoln Highway.

Night Stops—Philadelphia, Gettysburg, Bedford, Pittsburgh, Pa.; Canton, Lima, O.; South Bend, Ind.; Chicago, Ill.; Clinton, Marshalltown, Ia.; Omaha, Kearney, Neb.; Julesburg, Denver, Col.; Cheyenne, Rawlins, Green River, Wyo.; Salt Lake City, Kearney's Ranch, Utah; Ely, Austin, Reno, Nev.; Sacramento, San Francisco, Cal.

NEW YORK-PHILADELPHIA.

| Miles | | Miles |
|-------------------------|-------------------------|-------|
| New York..... 0.0 | Franklin Park..... 41.8 | |
| Weekawken..... 8.0 | Kingston..... 48.3 | |
| (via ferry)..... 3.7 | Princeton..... 51.5 | |
| Jersey City..... 8.0 | Lawrenceville..... 56.4 | |
| Newark..... 12.2 | Trenton..... 62.5 | |
| Elizabeth..... 17.1 | Oxford Valley..... 68.7 | |
| Rahway..... 23.0 | Glen Lake..... 70.6 | |
| Iselin..... 27.0 | Langhorne..... 71.6 | |
| Menlo Park..... 28.0 | La Tripp..... 76.6 | |
| Metuchen..... 29.8 | Busleton..... 81.7 | |
| New Brunswick..... 35.1 | Philadelphia..... 93.6 | |
| Highland Park..... 36.4 | | |

PHILADELPHIA-PITTSBURGH.

| Miles | | Miles |
|---------------------------|----------------------------|-------|
| Philadelphia..... 0.0 | W. Fayetteville..... 137.4 | |
| Overbrook..... 6.4 | Chambersburg..... 141.1 | |
| Ardmore..... 8.4 | St. Thomas..... 148.5 | |
| Bryn Mawr..... 9.7 | Fort Loudon..... 154.5 | |
| Wayne..... 14.1 | McConnellab'g..... 162.6 | |
| Berwyn..... 17.1 | Harrisonville..... 169.0 | |
| Paoli..... 20.4 | Breeseville..... 180.5 | |
| Whiteford..... 29.4 | Everett..... 188.9 | |
| Dowington..... 32.5 | Mt. Dallas..... 190.0 | |
| Thoradale Sta'n..... 34.6 | Bedford..... 197.8 | |
| Coatesville..... 38.8 | Wolfsburg..... 200.5 | |
| Sadsburyville..... 42.8 | Schellsburg..... 207.1 | |
| Mt. Vernon..... 47.0 | Bucktown..... 218.8 | |
| Gap..... 49.5 | Kanter P. O..... 222.8 | |
| Kincaid..... 51.8 | Stoyestown..... 223.8 | |
| Leaman Place..... 55.2 | Farrilton..... 229.8 | |
| Paradise..... 56.7 | Jenners..... 230.3 | |
| Southernburg..... 60.7 | Jenners town..... 231.3 | |
| Lancaster..... 65.0 | Laughlintown..... 239.8 | |
| Mountville..... 71.4 | Ligonier..... 243.1 | |
| Columbia..... 75.1 | Youngstown..... 251.7 | |
| Wrightsville..... 76.9 | Greensburg..... 251.6 | |
| York..... 88.0 | Grapeville..... 265.7 | |
| Abbottstown..... 102.9 | Adamsburg..... 268.4 | |
| New Oxford..... 110.6 | Irwin..... 271.2 | |
| Seven Stars..... 120.5 | Jacksonville..... 272.5 | |
| McKnight's..... 122.4 | E. McKeesport..... 278.7 | |
| Cashtown..... 124.3 | Turtle Creek..... 281.0 | |
| Crafton..... 129.2 | E. Pittsburgh..... 282.1 | |
| Calendonia Pk..... 131.2 | Wilkinsburg..... 284.9 | |
| Fayetteville..... 135.6 | Pittsburgh..... 292.3 | |

PITTSBURGH-FORT WAYNE.

| Miles | | Miles |
|-------------------------|---------------------------|-------|
| Pittsburgh..... 0.0 | Massillon..... 100.5 | |
| Bellevue..... 5.8 | W. Brookfield..... 111.6 | |
| Avalon..... 6.6 | E. Greenville..... 113.9 | |
| Glenfield..... 10.4 | Dalton..... 118.0 | |
| Sewickley..... 17.2 | East Union..... 124.8 | |
| Fairoaks..... 18.5 | Wooner..... 130.8 | |
| Ambridge..... 21.0 | Jefferson..... 134.8 | |
| Economy..... 21.8 | New Pittsburgh..... 140.2 | |
| Baden..... 25.0 | Rowsbury..... 143.5 | |
| Conway..... 26.4 | Ashland..... 150.7 | |
| Freedom..... 28.2 | Mansfield..... 164.2 | |
| Rockester..... 30.1 | Ontario..... 171.0 | |
| Bridgewater..... 30.8 | Gallon..... 179.2 | |
| Beaver..... 31.4 | Bucyrus..... 183.0 | |
| Eather..... 41.7 | Nevada..... 201.0 | |
| Ohioville..... 43.0 | Up. Sandusky..... 209.0 | |
| Smith's Ferry..... 46.0 | Forest..... 222.2 | |
| E. Liverpool..... 50.6 | Dunkirk..... 230.1 | |
| Lisbon..... 66.4 | Dola..... 233.9 | |
| Hanoverton..... 75.0 | Ada..... 240.8 | |
| Kennsington..... 77.0 | Lima..... 258.5 | |
| E. Rochester..... 81.7 | Gomer..... 268.1 | |
| Minerva..... 85.7 | Delphos..... 276.4 | |

| | |
|------------------------|-----------------------|
| Robertsville..... 81.5 | Van Wert..... 289.2 |
| Onnaburg..... 97.0 | Fort Wayne..... 321.9 |
| Canton..... 101.8 | |

FORT WAYNE-CLINTON.

| Miles | | Miles |
|-------------------------|---------------------------|-------|
| Fort Wayne..... 0.0 | Chic. Heights..... 154.9 | |
| Churubusco..... 13.6 | New Lenox..... 172.0 | |
| Merriam..... 22.6 | Joliet..... 178.1 | |
| Wolf Lake..... 25.6 | Plainfield..... 187.7 | |
| Kimmell..... 30.4 | Aurora..... 200.7 | |
| Ligonier..... 36.4 | Mooseheart..... 205.6 | |
| Beuton..... 46.7 | Batavia..... 209.6 | |
| Goshen..... 53.8 | Geneva..... 212.6 | |
| Elkhart..... 62.0 | De Kalb..... 234.0 | |
| Oascola..... 68.0 | Malta..... 239.8 | |
| Mishawaka..... 72.1 | Creston..... 245.6 | |
| South Bend..... 76.1 | Rochelle..... 251.7 | |
| New Carlisle..... 91.7 | Ashton..... 263.1 | |
| La Porte..... 103.7 | Franklin Grove..... 267.7 | |
| Westville..... 115.5 | Dixon..... 277.0 | |
| Valparaiso..... 126.5 | Sterling..... 290.2 | |
| Deep River..... 134.5 | Morrison..... 304.0 | |
| Merrillville..... 141.5 | Fulton..... 316.4 | |
| Schererville..... 147.3 | Clinton..... 319.7 | |
| Dyer..... 150.3 | | |

CLINTON-OMAHA.

| Miles | | Miles |
|--------------------------|---------------------------|-------|
| Clinton..... 0.0 | Ames..... 197.6 | |
| DeWitt..... 19.5 | Ontario..... 199.3 | |
| Grand Mount..... 25.0 | Jordan..... 207.9 | |
| Calamus..... 31.0 | Boone..... 213.7 | |
| Whetland..... 35.2 | Ogden..... 223.3 | |
| Lowden..... 41.2 | Grand Junction..... 233.3 | |
| Clarence..... 49.7 | Jefferson..... 243.6 | |
| Stanwood..... 54.4 | Seranton..... 253.6 | |
| Mechanicsville..... 60.0 | Glidden..... 265.1 | |
| Lisbon..... 66.9 | Carroll..... 254.1 | |
| Mt. Vernon..... 68.6 | West Side..... 266.4 | |
| Marion..... 81.5 | Vail..... 302.2 | |
| Cedar Rapids..... 86.7 | Dennison..... 311.2 | |
| Belle Plaine..... 122.2 | Arion..... 319.1 | |
| Chelsea..... 129.0 | Dow City..... 321.8 | |
| Gladstone..... 135.8 | Dunlap..... 329.9 | |
| Tama..... 140.0 | Woodbine..... 341.4 | |
| Montour..... 148.3 | Logan..... 352.0 | |
| Le Grand..... 152.5 | Missouri Val..... 360.7 | |
| Marshalltown..... 162.2 | Loveland..... 365.0 | |
| LaMolle..... 169.0 | Honey Creek..... 369.8 | |
| State Centre..... 176.3 | Crescent..... 375.6 | |
| Colo..... 183.7 | Council Bluffs..... 383.1 | |
| Nevada..... 190.7 | Omaha..... 387.7 | |

OMAHA-CHEYENNE.

| Miles | | Miles |
|-------------------------|-------------------------|-------|
| Omaha..... 0.0 | Gothenburg..... 259.3 | |
| Elkhorn..... 16.2 | Brady..... 272.4 | |
| Waterloo..... 19.5 | Maxwell..... 281.3 | |
| Valley..... 23.0 | North Platte..... 288.9 | |
| Fremont..... 34.9 | Hersey..... 307.0 | |
| Ames..... 42.8 | Sutherland..... 314.4 | |
| North Bend..... 50.9 | Paxton..... 327.4 | |
| Rogers..... 58.1 | Roscoe..... 339.7 | |
| Schuyler..... 66.5 | Ogallala..... 347.1 | |
| Richland P. O..... 74.9 | Brule..... 357.5 | |
| Columbus..... 83.1 | Megeath..... 362.2 | |
| Duncan..... 92.8 | Big Springs..... 368.0 | |
| Silver Creek..... 102.5 | Chappell..... 398.8 | |
| Clarke..... 113.6 | Lodge Pole..... 399.1 | |
| Central City..... 124.5 | Sunol..... 405.9 | |
| Chapman..... 134.7 | Sidney..... 417.1 | |
| Grand Island..... 147.5 | Brownson..... 426.2 | |
| Alda..... 155.3 | Potter..... 435.6 | |
| Wood River..... 164.8 | Dix Station..... 444.6 | |
| Shelton..... 174.0 | Kimball..... 454.1 | |
| Gibson..... 180.0 | Bushnell..... 466.0 | |
| Kearney..... 192.7 | Pine Bluffs..... 476.0 | |
| Odessa..... 201.8 | Ekbert..... 486.1 | |
| Elm Creek..... 208.7 | Burns..... 492.6 | |
| Overton..... 217.9 | Hilldale..... 500.4 | |
| Lexington..... 229.1 | Archer..... 511.8 | |
| Coxed..... 247.1 | Cheyenne..... 520.8 | |

CHEYENNE-SALT LAKE CITY.

| Miles | | Miles |
|--------------------------|----------------------------|-------|
| Cheyenne..... 0.0 | Latham Station..... 212.2 | |
| Corlett Station..... 5.7 | Wamsutter..... 220.2 | |
| Borlie Tower..... 9.3 | Tipton Station..... 236.5 | |
| Otto Station..... 14.2 | Point of Rocks..... 245.2 | |
| Granite Canyon..... 18.7 | Traver Junction..... 272.5 | |
| | Rock Springs..... 281.7 | |

| | | | |
|----------------------|-------|-----------------------|-------|
| Buford..... | 27.2 | Green River..... | 286.1 |
| Sherman Hill..... | 32.8 | Bryan Station..... | 300.8 |
| The Siding..... | 39.2 | Granger Junction..... | 325.8 |
| Laramie..... | 57.0 | Lyman..... | 354.2 |
| Bosler..... | 76.4 | Ft. Bridger..... | 359.8 |
| Lookout..... | 85.1 | Evansston..... | 395.1 |
| Harper..... | 90.6 | Wyata Station..... | 398.2 |
| Rock River..... | 96.8 | Wasatch..... | 405.1 |
| Medicine Bow..... | 116.8 | Castle Rock..... | 413.1 |
| Carbon..... | 127.0 | Emory Station..... | 420.2 |
| Evansville..... | 135.3 | Main Forks..... | 429.0 |
| Hanna..... | 139.5 | Coalville..... | 441.2 |
| Walcott..... | 155.5 | Hoytville..... | 444.2 |
| Ft. Steele..... | 163.1 | Wanship..... | 449.1 |
| Lakota..... | 169.6 | Kinball's Ranch..... | 459.1 |
| Granville..... | 173.4 | Roach's Ranch..... | 460.2 |
| Rawlins..... | 178.7 | Salt Lake City..... | 483.2 |
| Creston Station..... | 208.2 | | |

SALT LAKE CITY-ELY.

| Miles | | Miles |
|--------------------------|---------------------------|-------|
| Salt Lake City..... 0.0 | Orr's Ranch..... 87.2 | |
| Pleasant Green..... 15.0 | County Well..... 104.2 | |
| Ragtown..... 16.1 | Fish Springs..... 104.2 | |
| Garfield..... 20.3 | Callao..... 106.5 | |
| Lake Point..... 28.1 | Ibapath..... 102.2 | |
| Milltown..... 30.3 | Tippett..... 215.5 | |
| Granville..... 40.3 | Anderson's R'h..... 237.3 | |
| Timple Point..... 54.3 | Shellbourne..... 244.9 | |
| Joseph..... 70.2 | Magnuson's R'h..... 249.9 | |
| Brown's Ranch..... 77.3 | McGill..... 273.1 | |
| Indian Ranch..... 79.3 | East Ely..... 283.4 | |
| Indian Farm..... 84.3 | Ely..... 288.4 | |

ELY-RENO.

| Miles | | Miles |
|--------------------------|--------------------------|-------|
| Ely..... 0.0 | Austin Summit..... 151.9 | |
| Lane..... 2.4 | Austin..... 154.0 | |
| Copper Flat..... 6.0 | New Pass Can-..... 181.5 | |
| Relpetown..... 8.0 | yon..... 181.5 | |
| Kimberly..... 8.7 | Alpine Ranch..... 190.7 | |
| Jake's Summit..... 16.2 | Eastgate..... 214.3 | |
| Mooreman's R'h..... 30.7 | Westgate..... 224.1 | |
| Rosevear's R'h..... 32.7 | Mountain Well..... 240.3 | |
| White Pine..... 38.7 | Stillwater..... 249.3 | |
| Summit..... 38.7 | Fallon..... 278.7 | |
| Hamilton..... 44.2 | Hazen..... 286.4 | |
| Six Mile House..... 50.0 | Fernley..... 306.1 | |
| 14 Mile House..... 69.8 | Wadsworth..... 311.3 | |
| Pinto House..... 76.4 | Derby..... 316.5 | |
| Eureka..... 83.6 | Vista Station..... 336.4 | |
| Rigley Ranch..... 96.9 | Sparks..... 343.8 | |
| Grimes' Ranch..... 124.9 | Reno..... 347.8 | |

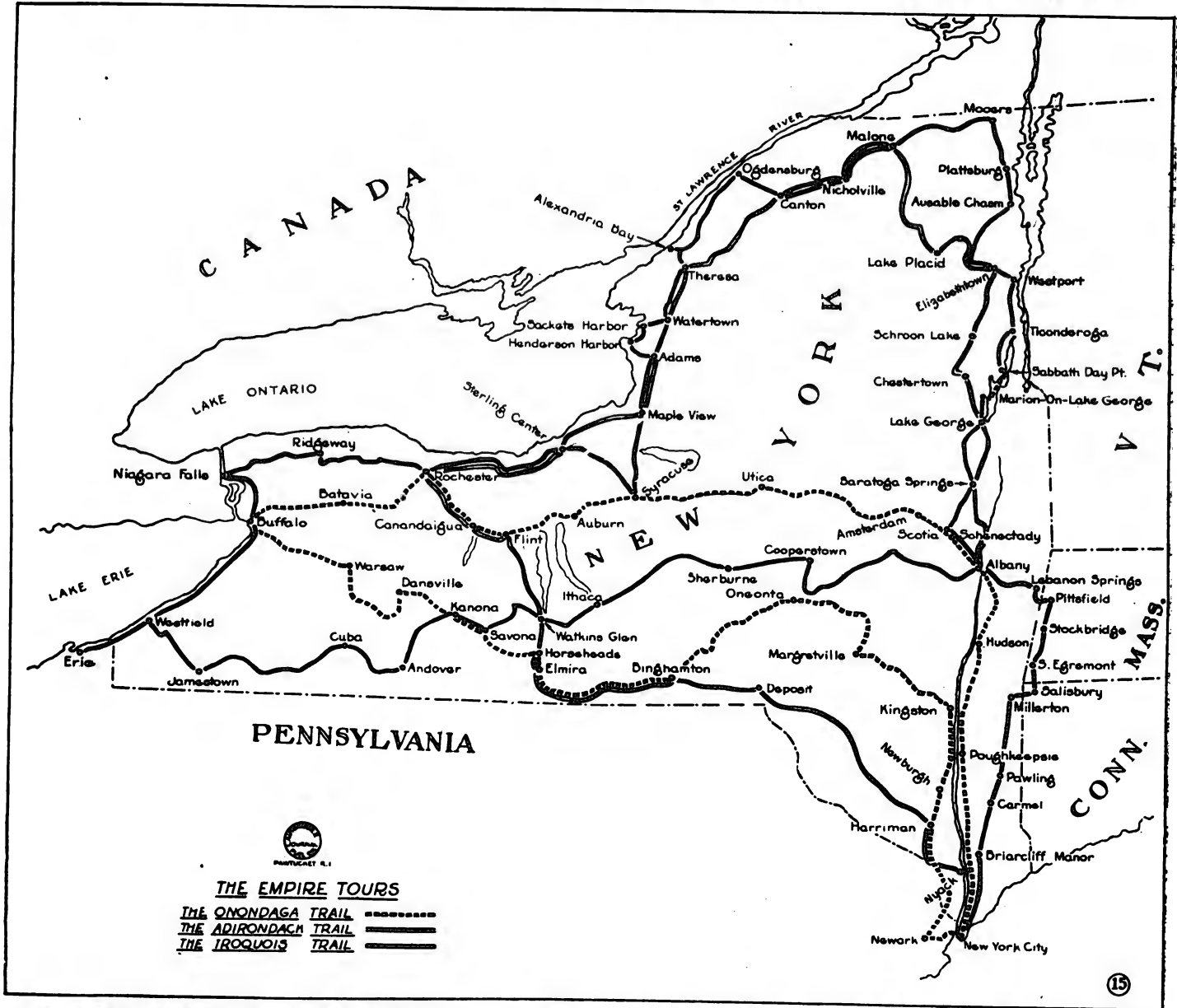
RENO-SAN FRANCISCO.

| Miles | | Miles |
|--------------------------|--------------------------|-------|
| Reno..... 0.0 | Roseville..... 122.9 | |
| Verdi..... 10.7 | Sacramento..... 139.7 | |
| Truckee..... 32.7 | Elk Grove..... 162.7 | |
| Donner..... 37.7 | McConnell..... 167.7 | |
| Emigrant Gap..... 62.7 | Arno..... 159.7 | |
| Dutch Flat or..... 165.7 | Galt..... 165.7 | |
| Alta..... 75.8 | Woodbridge..... 173.7 | |
| Gold Run..... 79.0 | Stockton..... 187.7 | |
| Colfax..... 89.0 | French Camp..... 192.8 | |
| Wyman..... 92.2 | Banta..... 204.4 | |
| Applegate..... 95.0 | Altamont..... 221.9 | |
| Auburn..... 104.5 | Tracy..... 206.1 | |
| New Castle..... 109.3 | Livermore..... 229.7 | |
| Penryn..... 112.6 | Hayward..... 257.2 | |
| Loomis..... 114.4 | Oakland..... 263.9 | |
| Rocklin..... 117.0 | San Francisco..... 267.9 | |

RENO-SACRAMENTO.

| Miles | | Miles |
|--------------------------|-----------------------------|-------|
| Reno..... 0.0 | Sportsman's Hall..... 106.4 | |
| Steamboat Spgs..... 10.1 | Chino..... 110.9 | |
| Washoe..... 15.1 | Placerville..... 117.4 | |
| Franktown..... 20.1 | Eldorado..... 125.0 | |
| Carson City..... 31.7 | Shingle Springs..... 129.9 | |
| Glenbrook..... 47.1 | Clarksville..... 137.5 | |
| Cave Rock..... 50.1 | White Rock..... 141.0 | |
| Edgewood..... 56.7 | Folsom..... 147.1 | |
| Lakeside Park..... 57.8 | Natomas..... 148.3 | |
| Meysers..... 65.7 | Mill..... 157.1 | |
| Sierra Nevada..... 68.9 | Mayhew..... 160.0 | |
| Summit..... 71.4 | Manlove..... 161.1 | |
| Phillips..... 71.4 | Perkins..... 163.2 | |
| Strawberry..... 76.1 | Sacramento..... 168.4 | |
| Kyburz..... 85.8 | | |
| Riverton..... 95.3 | | |

NEW YORK STATE SHOWING EMPIRE TOURS



The Empire Tours Are Crowded with Interest. The Above Map Shows the Onondaga, Adirondack and Iroquois Trails. Good Roads Go to Make Up These Tours, and the Scenery Is Splendid Throughout.

THE ADIRONDACK TRAIL

New York-Pittsfield.

| Miles | Miles |
|------------------------------------|--------------------------------|
| N. Y. (Madison ave. & 43d st.) 0.0 | Carmel 58.6 |
| Yonkers 14.4 | Patterson 68.2 |
| Hast-on-Hud. 17.9 | Pawling 71.8 |
| Dobbs Ferry... 18.9 | S. Dover 79.6 |
| Irvington 21.4 | Dover Plains... 85.8 |
| Tarrytown 24.1 | Wassaic 91.4 |
| Scarboro 28.3 | Amenia 94.8 |
| (Onondaga Trail starts here.) | Millerton 103.6 |
| Briarcliff 31.9 | Lakeville, Ct. 106.9 |
| Kitchawan 38.0 | Salisbury 108.6 |
| Croton Lake St. 38.3 | S. Egremont P. O., Mass. 121.6 |
| Yorktown Hts. 42.7 | G. Barrington. 125.6 |
| Amawalk Sta. 44.4 | Stockbridge ... 133.0 |
| Baldwin P. O. 49.4 | Lenox 139.8 |
| Lake Mahopac. 53.0 | Pittsfield 146.4 |

Pittsfield, Mass.-Saratoga Springs.

| Miles | Miles |
|----------------------|-----------------------|
| Pittsfield 0.0 | Loudenville ... 40.7 |
| Shaker Village. 4.5 | Newtonville ... 42.0 |
| New Lebanon.. 10.8 | Latham's cors. 43.8 |
| N. Leb. Center. 12.2 | Cohoes 48.2 |
| West Lebanon. 14.9 | Waterford 50.1 |
| Nassau 23.5 | Mechanicville. 58.9 |
| E. Greenbush.. 30.8 | Maltaville 64.8 |
| Rensselaer 35.2 | Malta 67.0 |
| Albany 36.0 | Saratoga Spgs. 75.1 |

Saratoga-Schroon Lake.

| Miles | Miles |
|----------------------|-----------------------|
| Saratoga 0.0 | Warrensburg... 34.2 |
| Wilton 7.4 | Chesterstown.. 46.2 |
| S. Glen Falls.. 17.8 | Potterville 55.0 |
| Glen Falls..... 18.7 | Taylor-on- |

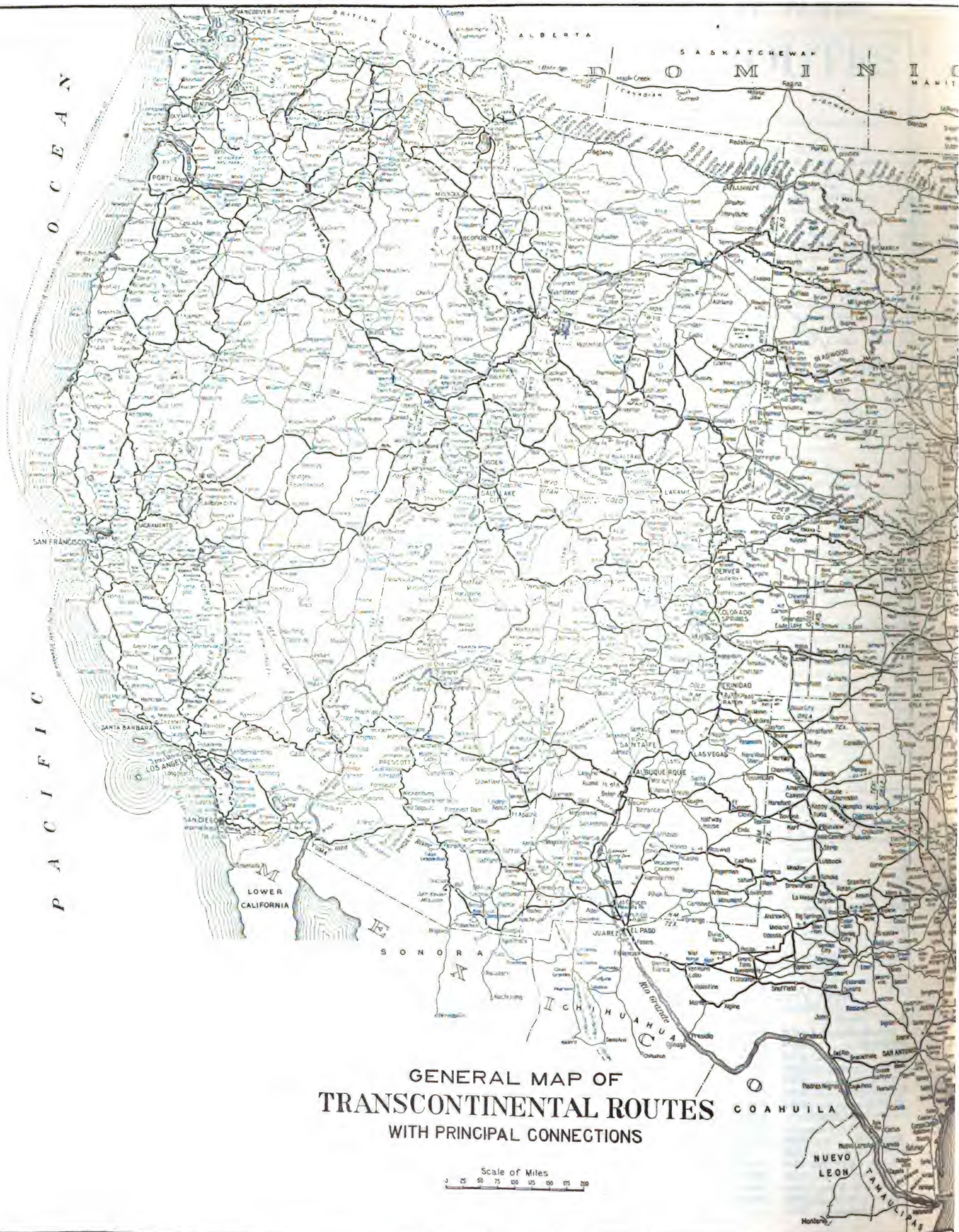
| | |
|---------------------|----------------------|
| French Mount. 24.0 | Schroon 58.7 |
| Lake George... 28.1 | Schroon Lake... 54.3 |

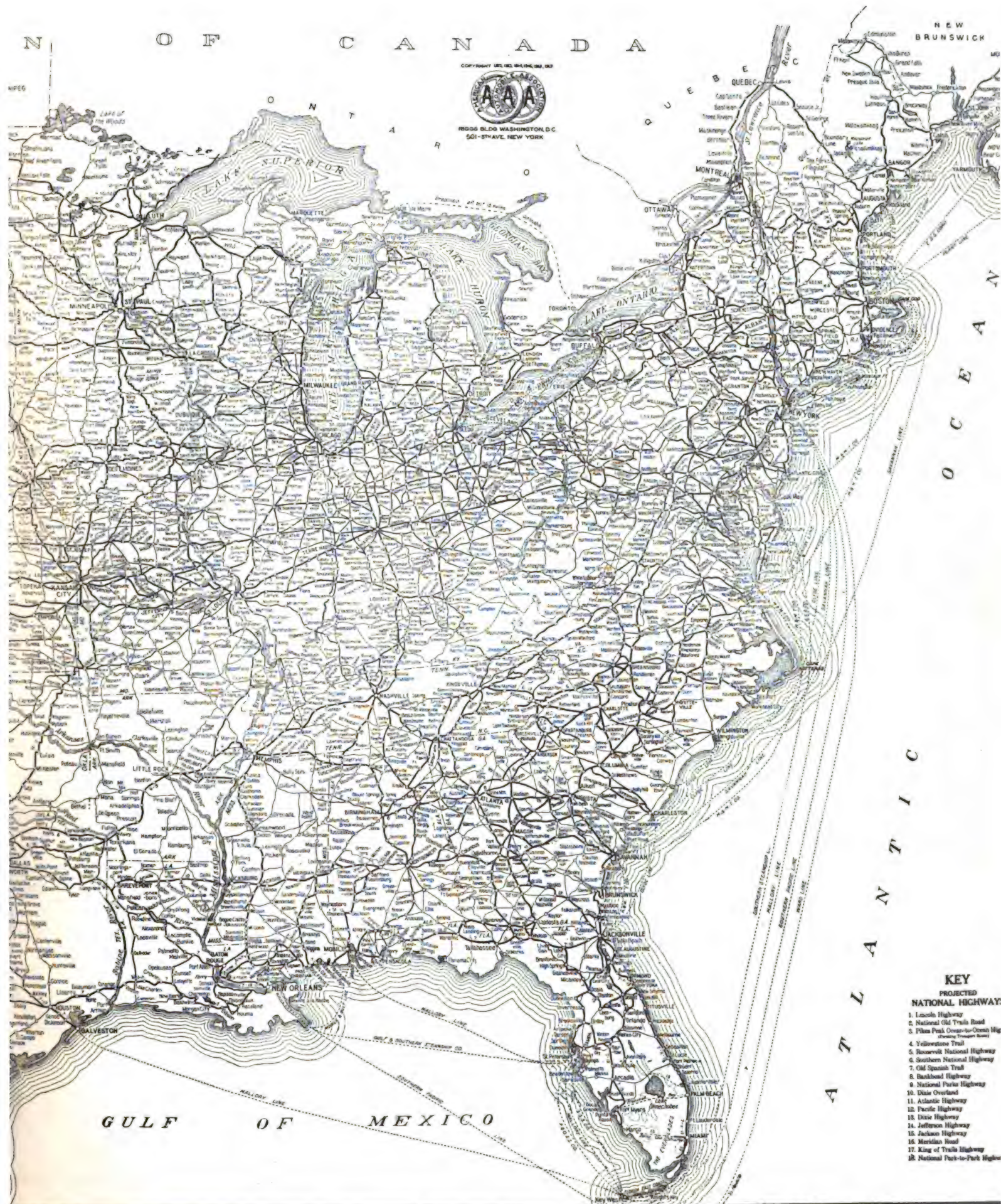
Schroon Lake-Lake Placid.

| Miles | Miles |
|---------------------|---------------------|
| Schroon Lake... 0.0 | Jay 53.3 |
| Schroon River. 9.3 | Wilmington ... 58.0 |
| Euba Mills.... 21.4 | Wilm'ton Notch 58.4 |
| Elizabethtown. 31.5 | Newman 70.8 |
| Keene 43.6 | Lake Placid... 71.4 |
| Upper Jay..... 49.7 | |

Lake Placid-Malone.

| Miles | Miles |
|----------------------|----------------------|
| Lake Placid... 0.0 | McColloma 28.4 |
| Saranac Lake.. 9.5 | Dunne Center.. 40.3 |
| Gabriel Sta.... 18.3 | Whippleville .. 54.2 |
| Brighton 20.7 | Malone 57.6 |
| Paul Smith's... 21.8 | |





Malone-Watertown.

| Miles | Miles |
|----------------------|---------------------|
| Malone 0.0 | De Kalb Jet... 60.4 |
| N. Banger..... 5.3 | Old De Kalb... 64.4 |
| Brushton..... 10.9 | Richville..... 72.0 |
| Molra..... 13.1 | Gouverneur.... 78.5 |
| Lawrenceville.. 18.6 | Somerville.... 86.1 |
| Nicholville.... 24.9 | Antwerp..... 90.8 |
| Hopkinton..... 27.3 | Theresa..... 102.3 |
| Potsdam..... 41.5 | Pamella..... 112.3 |
| Waterloo..... 43.5 | Watertown.... 120.9 |
| Eddy..... 57.3 | |

Watertown-Oswego.

| Miles | Miles |
|----------------------|--------------------|
| Watertown..... 0.0 | Pulaski..... 31.7 |
| Adams Center.. 10.0 | Maple View... 39.4 |
| Adams..... 13.6 | Mexico..... 43.7 |
| Pierrepont Man. 19.4 | New Haven.... 48.4 |
| Mannsville.... 21.0 | Scriba..... 54.4 |
| Sandy Creek... 26.0 | Oswego..... 58.8 |

Oswego-Rochester.

| Miles | Miles |
|----------------------|----------------------|
| Oswego..... 0.0 | Williamson.... 48.1 |
| Sterling Center 12.7 | Ontario..... 53.1 |
| Red Creek..... 21.3 | Ontario Center 54.4 |
| Wolcott..... 27.0 | Fruitland P. O. 56.9 |
| Alton..... 36.8 | Union Hill.... 57.9 |
| Wallington Sta. 38.6 | Webster..... 60.8 |
| Sodus..... 41.3 | W. Webster... 64.1 |
| E. Williamson.. 45.6 | Rochester.... 72.1 |

Rochester-Watkins.

| Miles | Miles |
|---------------------|---------------------|
| Rochester..... 0.0 | Stanley..... 42.0 |
| Pittsford..... 7.6 | Halls Corners 45.6 |
| Mendon..... 14.1 | Benton Center 50.6 |
| Victor..... 19.4 | Penn Yan.... 54.6 |
| Canandaigua... 29.3 | Dundee..... 66.6 |
| Hopewell..... 37.3 | Reading Center 74.0 |
| Flint..... 39.3 | Watkins..... 79.7 |

Watkins-Elmira.

| Miles | Miles |
|-------------------|-----------------------|
| Watkins..... 0.0 | Horseheads... 16.4 |
| Montour Falls 2.9 | Elmira Hts. Sta. 19.1 |

| | |
|----------------------|------------------|
| Millport..... 9.3 | Elmira..... 22.3 |
| Pine Valley.... 12.0 | |

Elmira-Binghamton.

| Miles | Miles |
|----------------------|--------------------|
| Elmira..... 0.0 | Owego..... 36.3 |
| Lowman..... 6.5 | Apalachin.... 43.3 |
| Chemung..... 12.4 | Vestal..... 49.5 |
| Waverly..... 17.1 | Union..... 50.3 |
| Fork..... 17.9 | Endicott..... 52.4 |
| Barton..... 23.8 | Johnson City 54.0 |
| Smithboro.... 26.5 | Binghamton... 58.6 |
| Tioga Center... 30.5 | |

Binghamton-Liberty.

| Miles | Miles |
|---------------------|----------------------|
| Binghamton.... 0.0 | Horton..... 63.5 |
| Windsor..... 15.6 | Cook's Falls... 66.2 |
| Damascus..... 17.9 | Roscoe..... 72.0 |
| Deposit..... 31.0 | Livingston Man. 78.8 |
| Hale Eddy..... 35.9 | Parkville Sta. 84.2 |
| Hancock..... 44.3 | Liberty..... 88.2 |

Liberty-Goshen.

| Miles | Miles |
|---------------------|---------------------|
| Liberty..... 0.0 | Bloomington... 28.5 |
| Monticello.... 12.1 | Middletown... 36.7 |
| Wartaboro.... 24.1 | Goshen..... 45.1 |
| High View..... 27.3 | |

Goshen-New York.

| Miles | Miles |
|----------------------|-------------------------------------|
| Goshen..... 0.0 | Nanuet..... 35.9 |
| Chester..... 4.3 | Nyack..... 41.0 |
| Monroe..... 9.2 | Tarrytown.... 41.8 |
| Harriman..... 11.5 | Irrington.... 44.5 |
| Southfields... 16.7 | Dobbs Ferry... 46.0 |
| Tuxedo..... 20.8 | Hastings..... 47.8 |
| Sloatsburg.... 23.5 | Yonkers..... 52.0 |
| Suffern..... 27.6 | 43d and Madison ave., N. Y. C. 65.6 |
| Monsey..... 32.2 | |
| Spring Valley.. 33.4 | |

NIAGARA FALLS TOUR.**New York-Poughkeepsie.**

| Miles | Miles |
|-------------------|------------------|
| New York..... 0.0 | Harmon..... 32.7 |

| | |
|---------------------|------------------------|
| Yonkers..... 14.4 | Oroton..... 33.8 |
| Hast-on-Hud... 17.9 | Peekskill..... 41.5 |
| Dobbs Ferry... 18.9 | Flashkill Village 60.9 |
| Irrington..... 21.4 | Wap'gers Falls 66.0 |
| Tarrytown.... 24.1 | Poughkeepsie.. 73.7 |
| Ossing..... 30.0 | |

Poughkeepsie-Albany.

| Miles | Miles |
|---------------------------------|-----------------------|
| Poughkeepsie.. 0.0 | Blue Stores... 30.8 |
| Hyde Park..... 6.2 | Livingston.... 34.0 |
| Staatsburg.... 10.2 | Hudson..... 42.3 |
| Rhinebeck.... 16.3 | Stockport.... 48.2 |
| Red Hook..... 21.7 | Stuyv'sant Falls 51.7 |
| Up. Red Hook.. 24.4 | Kinderhook.... 54.9 |
| Nevis..... 27.0 | Valatie..... 56.0 |
| Clermont..... 28.9 | E. Greenbush.. 54.9 |
| (Adirondack Trail Starts Here.) | |
| Rensselaer.... 74.4 | Albany..... 75.3 |

Albany-Utica.

| Miles | Miles |
|----------------------|-----------------------|
| Albany..... 0.0 | Nelliston..... 56.0 |
| Schenectady... 14.9 | St. Johnsville.. 61.9 |
| Scotia..... 16.5 | Little Falls... 72.2 |
| Amsterdam.... 30.8 | Herkimer..... 79.3 |
| Fort Johnson.. 33.7 | Mohawk..... 80.9 |
| Tribes Hill... 36.1 | Ithaca..... 82.5 |
| Fonda..... 41.5 | Frankfort..... 85.0 |
| Palatine Bridge 53.1 | Utica..... 94.6 |

Utica-Syracuse.

| Miles | Miles |
|----------------------|----------------------|
| Utica..... 0.0 | Chittenango... 34.0 |
| New Hartford. 3.0 | Mycenae..... 37.3 |
| Vernon..... 16.5 | Manlius Center 41.3 |
| Oneida Castle.. 21.7 | East Syracuse.. 45.1 |
| Wampsville.... 24.9 | Syracuse..... 45.9 |
| Canastota..... 27.3 | |

Syracuse-Rochester.

| Miles | Miles |
|---------------------|---------------------|
| Syracuse..... 0.0 | Flint..... 57.9 |
| Camillus..... 8.3 | Hopewell..... 60.0 |
| Elbridge..... 15.3 | Canandaigua... 67.4 |
| Sennett..... 20.4 | Victor..... 77.6 |
| Auburn..... 25.4 | Mendon..... 83.0 |
| Seneca Falls.. 40.1 | Pittsford..... 89.6 |
| Waterloo..... 43.5 | Rochester.... 97.2 |

THE ONONDAGA TRAIL

New York-Poughkeepsie.

| Miles | Miles |
|---------------------|------------------------|
| New York..... 0.0 | Harmon..... 32.7 |
| Yonkers..... 14.4 | Croton..... 33.8 |
| Hast-on-Hud... 17.9 | Peekskill..... 41.5 |
| Dobbs Ferry... 18.9 | Flashkill Village 60.9 |
| Irrington..... 21.4 | Wap'gers Falls 66.0 |
| Tarrytown.... 24.1 | Poughkeepsie.. 73.7 |
| Ossing..... 30.0 | |

Poughkeepsie-Albany.

| Miles | Miles |
|---------------------------------|-----------------------|
| Poughkeepsie.. 0.0 | Blue Stores... 30.8 |
| Hyde Park..... 6.2 | Livingston.... 34.0 |
| Staatsburg.... 10.2 | Hudson..... 42.3 |
| Rhinebeck.... 16.3 | Stockport.... 48.2 |
| Red Hook..... 21.7 | Stuyv'sant Falls 51.7 |
| Up. Red Hook.. 24.4 | Kinderhook.... 54.9 |
| Nevis..... 27.0 | Valatie..... 56.0 |
| Clermont..... 28.9 | E. Greenbush.. 54.9 |
| (Adirondack Trail Starts Here.) | |
| Rensselaer.... 74.4 | Albany..... 75.3 |

Albany-Utica.

| Miles | Miles |
|----------------------|-----------------------|
| Albany..... 0.0 | Nelliston..... 56.0 |
| Schenectady... 14.9 | St. Johnsville.. 61.9 |
| Scotia..... 16.5 | Little Falls... 72.2 |
| Amsterdam.... 30.8 | Herkimer..... 79.3 |
| Fort Johnson.. 33.7 | Mohawk..... 80.9 |
| Tribes Hill... 36.1 | Ithaca..... 82.5 |
| Fonda..... 41.5 | Frankfort..... 85.0 |
| Palatine Bridge 53.1 | Utica..... 94.6 |

Utica-Syracuse.

| Miles | Miles |
|----------------------|----------------------|
| Utica..... 0.0 | Chittenango... 34.0 |
| New Hartford. 3.0 | Mycenae..... 37.3 |
| Vernon..... 16.5 | Manlius Center 41.3 |
| Oneida Castle.. 21.7 | East Syracuse.. 45.1 |
| Wampsville.... 24.9 | Syracuse..... 45.9 |
| Canastota..... 27.3 | |

Syracuse-Rochester.

| Miles | Miles |
|---------------------|---------------------|
| Syracuse..... 0.0 | Flint..... 57.9 |
| Camillus..... 8.3 | Hopewell..... 60.0 |
| Elbridge..... 15.3 | Canandaigua... 67.4 |
| Sennett..... 20.4 | Victor..... 77.6 |
| Auburn..... 25.4 | Mendon..... 83.0 |
| Seneca Falls.. 40.1 | Pittsford..... 89.6 |
| Waterloo..... 43.5 | Rochester.... 97.2 |
| Geneva..... 51.0 | |

Rochester-Buffalo.

| Miles | Miles |
|----------------------|----------------------|
| Rochester..... 0.0 | Pattavia..... 37.3 |
| Scottsville.... 12.4 | East Pembroke. 43.4 |
| Garbutt..... 14.7 | Pembroke..... 50.3 |
| Mumford..... 18.9 | Clarence..... 58.3 |
| Calodonia.... 20.2 | Williamsville.. 66.2 |
| LeRoy..... 27.3 | Snyder..... 68.2 |
| Stafford..... 31.4 | Buffalo..... 75.9 |

Buffalo-Dansville.

| Miles | Miles |
|------------------|--------------------|
| Buffalo..... 0.0 | Rock Glen.... 47.0 |

| | |
|----------------------|-----------------------|
| Ebeneser..... 7.9 | Silver Springs.. 51.1 |
| E. Aurora..... 17.5 | Castle..... 54.9 |
| Varysburg.... 32.8 | Portageville... 59.9 |
| Orangeville... 36.4 | Hunts..... 64.4 |
| Halls Corners.. 39.1 | Canaseraga.... 78.4 |
| Warsaw..... 42.3 | Dansville..... 88.9 |

Dansville-Elmira.

| Miles | Miles |
|--------------------|----------------------|
| Dansville..... 0.0 | Campbell..... 41.5 |
| Wayland..... 6.3 | Coopers..... 46.2 |
| Cohocton..... 14.7 | Painted Post... 49.3 |
| Avoca..... 22.4 | Corning..... 51.8 |
| Kanona..... 26.8 | Big Flats..... 58.7 |
| Bath..... 30.6 | Elmira Hts.... 65.3 |
| Savona..... 37.0 | Elmira..... 70.6 |

Elmira-Binghamton.

| Miles | Miles |
|----------------------|--------------------|
| Elmira..... 0.0 | Owego..... 36.3 |
| Lowman..... 6.5 | Apalachin.... 43.3 |
| Chemung..... 12.4 | Vestal..... 49.5 |
| Waverly..... 17.1 | Union..... 50.2 |
| Barton..... 23.8 | Endicott..... 52.4 |
| Smithboro.... 26.5 | Johnson City 56.0 |
| Tioga Center... 30.5 | Binghamton... 58.6 |

Binghamton-Oneonta.

| Miles | Miles |
|----------------------|---------------------|
| Binghamton... 0.0 | Bainbridge.... 33.2 |
| Port Crane.... 7.3 | Sidney..... 39.4 |
| Sanitaria Spgs. 10.0 | Unadilla..... 43.8 |

| | | | |
|-----------------|------|-----------------|------|
| Reiden..... | 16.8 | Wells Bridge... | 49.2 |
| Harpersville... | 20.3 | Otego..... | 53.6 |
| Nineveh..... | 23.1 | Oneonta..... | 61.8 |
| Afton..... | 27.4 | | |

Oneonta-Kingston.

| Miles | | Miles | |
|-----------------|------|-----------------|------|
| Oneonta..... | 0.0 | Highmont..... | 62.8 |
| Davenport Gen. | 8.6 | Pine Hill..... | 64.9 |
| Davenport..... | 13.0 | Shandaken..... | 69.8 |
| Harpersfield... | 22.5 | Allagen..... | 71.4 |
| Stamford..... | 27.0 | Phoenicia..... | 75.7 |
| Grand Gorge... | 35.0 | Mt. Pleasant... | 79.5 |
| Roxbury..... | 42.4 | Belleville..... | 83.0 |

| | | | |
|------------------|------|----------------|-------|
| Halcottville... | 48.6 | Sheknan..... | 86.9 |
| Kelley Cors.... | 50.5 | Ashokan..... | 87.8 |
| Margaretville... | 54.2 | West Hurley... | 94.2 |
| Arkville..... | 55.7 | Kingston..... | 101.0 |
| Fleischmanns... | 60.6 | | |

Kingston-Newburgh.

| Miles | | Miles | |
|-----------------|-----|----------------|------|
| Kingston..... | 0.0 | Highland..... | 16.9 |
| Bondout..... | 2.4 | Milton..... | 21.3 |
| Port Ewen..... | 3.2 | Marlboro..... | 25.3 |
| Uster Park..... | 6.6 | Middle Hope... | 29.0 |
| Esopus..... | 9.0 | Newburgh..... | 33.3 |

Newburgh-New York.

| Miles | | Miles | |
|-----------------|------|-----------------|------|
| Newburgh..... | 0.0 | Ramsey..... | 37.2 |
| Valis Gate..... | 4.8 | Allendale..... | 39.1 |
| Woodbury..... | 12.2 | Hoehokus..... | 41.5 |
| Highland Mills | 13.9 | Arcoia..... | 47.0 |
| Central Valley | 15.1 | Hasbrouck Hts. | 52.8 |
| Harriman Sta. | 17.0 | Rutherford..... | 55.4 |
| Southfields.... | 22.0 | W. Arlington... | 59.8 |
| Tuxedo..... | 26.1 | Newark..... | 63.7 |
| Sloatsburg..... | 28.8 | Jersey City.... | 69.1 |
| Suffern..... | 32.9 | New York..... | 74.9 |
| Mahwah..... | 34.6 | | |

THE IROQUOIS TRAIL

Erie, Pa.-Buffalo, N. Y.

| Miles | | Miles | |
|------------------|------|-----------------|------|
| Erie..... | 0.0 | Irving..... | 60.7 |
| Harbour Creek | 8.2 | Farnham..... | 62.7 |
| Moorheadville.. | 11.0 | Brant..... | 66.6 |
| North East, Pa. | 15.2 | Angola..... | 70.2 |
| Ripley, N. Y.... | 22.7 | Evans..... | 71.7 |
| Forsyth..... | 26.3 | Jerusalem Cors. | 73.8 |
| Westfield..... | 30.5 | Wanskah..... | 80.9 |
| Portland..... | 37.4 | Lake View..... | 82.6 |
| Brocton..... | 38.9 | Athol Springs.. | 83.8 |
| Lamberton..... | 41.7 | Bay View..... | 84.8 |
| Fredonia..... | 45.6 | WoodPn Beach.. | 86.1 |
| Sheridan..... | 51.5 | Buffalo..... | 93.0 |
| Silver Creek... | 57.3 | | |

Buffalo-Niagara.

| Miles | | Miles | |
|-----------------|------|-----------------|------|
| Buffalo..... | 0.0 | Niagara Falls.. | 26.4 |
| St. Johnsbury.. | 16.3 | | |

Niagara Falls-Rochester.

| Miles | | Miles | |
|-----------------|------|-----------------|------|
| Niagara Falls.. | 0.0 | Albion..... | 57.3 |
| Pekin..... | 13.6 | Holly..... | 66.9 |
| Cambria..... | 20.6 | Brookport.... | 72.0 |
| Wright's Cors.. | 26.8 | Clarkson..... | 73.1 |
| Ridge Rd. Vil.. | 29.5 | Garland..... | 75.0 |
| Hartland..... | 33.3 | Parma..... | 80.0 |
| Johnson Creek. | 36.1 | W. Greece..... | 81.9 |
| Jeddo..... | 39.5 | Greece..... | 84.9 |
| Ridgeway..... | 43.8 | Uptonville Sta. | 88.2 |
| Medina..... | 46.5 | Rochester..... | 91.4 |

Rochester-Syracuse.

| Miles | | Miles | |
|-----------------|------|-----------------|------|
| Rochester..... | 0.0 | Walcott..... | 45.1 |
| W. Webster.... | 8.0 | Red Creek..... | 50.9 |
| Webster..... | 11.3 | Bear Haven.... | 56.1 |
| Fruitland..... | 16.1 | Sterling Center | 59.4 |
| Ontario Center | 17.7 | Hannibal..... | 63.1 |
| Ontario..... | 19.0 | Granby Center. | 68.8 |
| Williamson..... | 24.0 | Fulton..... | 71.9 |
| E. Williamson. | 26.5 | Phoenix..... | 80.8 |
| Sodus..... | 30.8 | Three River Pt. | 83.0 |
| Wallington.... | 33.5 | Liverpool..... | 91.1 |
| Alton..... | 35.3 | Syracuse..... | 96.0 |

Syracuse-Watertown.

| Miles | | Miles | |
|-----------------|------|------------------|------|
| Syracuse..... | 0.0 | Mannsville.... | 47.5 |
| Cicero..... | 9.4 | Pierrepont Man. | 49.1 |
| Brewerton P. O. | 13.8 | Adams..... | 54.9 |
| Hastings Cent'r | 19.3 | Roberts Cor.... | 60.3 |
| Hastings P. O. | 23.2 | Henderson..... | 64.4 |
| Colosse..... | 26.5 | Henderson Har. | 66.6 |
| Maple View.... | 29.1 | Sackett's Harbor | 75.1 |
| Palaaki..... | 36.8 | Watertown..... | 85.5 |
| Sandy Creek... | 42.5 | | |

Watertown-Ogdensburg.

| Miles | | Miles | |
|----------------|------|----------------|------|
| Watertown..... | 0.0 | Oakvale..... | 45.2 |
| Pamella..... | 8.7 | Hammond..... | 49.0 |
| Theresa..... | 18.6 | Briarhill..... | 55.3 |
| Pleasant..... | 24.2 | Morristown.... | 59.5 |
| Alexandria Bay | 30.3 | Ogdensburg.... | 70.5 |
| Redwood..... | 37.8 | | |

Ogdensburg-Malone.

| Miles | | Miles | |
|---------------|-----|-----------------|------|
| Ogdensburg... | 0.0 | Lawrenceville.. | 52.2 |

| | | | |
|-----------------|------|----------------|------|
| Canton..... | 18.5 | Moira..... | 57.7 |
| Potsdam..... | 29.3 | Brushton..... | 59.9 |
| Hopkinton..... | 43.6 | N. Bangor..... | 65.5 |
| Nicholville.... | 45.9 | Malone..... | 70.8 |

Malone-Plattsburg.

| Miles | | Miles | |
|----------------|------|-----------------|------|
| Malone..... | 0.0 | Moers..... | 39.8 |
| Burk..... | 7.3 | Sciota..... | 44.8 |
| Chateaugay.... | 12.3 | W. Chazy..... | 50.6 |
| Ellenburg Cen. | 25.0 | Beekmantown.. | 54.2 |
| Ellburg Depot | 27.7 | E. Beek'town.. | 56.1 |
| Moers Forks.. | 36.7 | Plattsburg..... | 60.7 |

Plattsburg-Elizabethtown.

| Miles | | Miles | |
|-----------------|------|-----------------|------|
| Plattsburg..... | 0.0 | Jay..... | 32.6 |
| Ausable Chasm | 13.2 | Upper Jay..... | 36.2 |
| Keeseville.... | 15.3 | Keene..... | 42.3 |
| Clintonville... | 21.2 | Elizabethtown.. | 54.4 |
| Ausable Forks. | 36.7 | | |

Elizabethtown-Saratoga.

| Miles | | Miles | |
|------------------|------|-----------------|------|
| Elizabethtown.. | 0.0 | Bolton..... | 51.8 |
| Westport..... | 9.1 | Marion-on-Lake | |
| End of road... | 18.9 | George..... | 54.2 |
| Port Henry.... | 19.2 | Diamond Point. | 55.9 |
| Fork..... | 19.5 | Lake George.... | 59.8 |
| Crown Point... | 26.5 | Luzerne..... | 71.8 |
| Ticonderoga... | 35.1 | Corinth..... | 77.4 |
| Hague..... | 44.1 | S. Corinth..... | 81.5 |
| Silver Bay..... | 47.8 | Greenfield Cen. | 96.3 |
| Sabbath Day Pt. | 49.9 | Saratoga Spgs.. | 91.6 |
| Bt. Ld for Bol'n | 56.0 | | |

Saratoga-Albany.

| Miles | | Miles | |
|-----------------|------|-----------------|------|
| Saratoga Spgs.. | 0.0 | Scotia..... | 21.8 |
| Ballston Spa... | 6.8 | Schenectady.... | 23.3 |
| Ballston Lake. | 13.6 | Woodlawn..... | 26.6 |
| Burnt Hills.... | 14.6 | Albany..... | 38.4 |

Albany-Cooperstown.

| Miles | | Miles | |
|-----------------|------|------------------|------|
| Albany..... | 0.0 | Richmondville.. | 52.8 |
| Delmar..... | 5.4 | E. Worcester.... | 59.8 |
| Clarksville.... | 13.5 | Worcester..... | 64.5 |
| E. Berne..... | 21.2 | Schenevus..... | 69.8 |
| Berne..... | 25.0 | Maryland..... | 73.2 |
| W. Berne..... | 27.8 | Cooper'tn June. | 78.6 |
| Gallupville.... | 31.7 | Colliersville... | 79.7 |
| Vrooman's Cor. | 35.6 | Portlandville.. | 83.4 |
| Central Bridge | 39.0 | Milford..... | 87.9 |
| Cobleskill..... | 47.8 | Cooperstown... | 96.2 |
| Warnerville.... | 49.1 | | |

Cooperstown-Watkins.

| Miles | | Miles | |
|----------------|------|-----------------|-------|
| Cooperstown... | 0.0 | De Ruyter..... | 57.3 |
| Fly Creek..... | 5.5 | Truxton..... | 65.7 |
| Oakville..... | 6.7 | Cortland..... | 76.8 |
| Burlington.... | 13.2 | Dryden..... | 86.9 |
| W. Burlington. | 17.0 | Ithaca..... | 88.7 |
| Edmeston..... | 20.0 | Newfield..... | 106.4 |
| Sherburne..... | 38.8 | Alpine..... | 116.0 |
| Smyrna..... | 38.1 | Odessa..... | 120.0 |
| Booney..... | 43.8 | Montour Falls.. | 123.3 |
| Otselic..... | 46.7 | Watkins..... | 126.2 |

Watkins-Hornell.

| Miles | | Miles | |
|---------------|------|--------------|------|
| Watkins..... | 0.0 | Bath..... | 29.6 |
| Tyrone..... | 9.9 | Kanona..... | 33.4 |
| Bradford..... | 14.6 | Howard..... | 42.3 |
| Sonora..... | 18.8 | Hornell..... | 53.6 |
| Savona..... | 23.3 | | |

Hornell-Jamestown.

| Miles | | Miles | |
|-----------------|------|----------------|-------|
| Hornell..... | 0.0 | Olean..... | 67.0 |
| Almond..... | 5.3 | Alleghany..... | 71.0 |
| Alfred Station. | 9.1 | Vandalia..... | 75.9 |
| Andover..... | 17.8 | Carrollton.... | 79.9 |
| Wellsville.... | 26.6 | Salamanca..... | 85.9 |
| Sci..... | 31.4 | Red House..... | 92.7 |
| Belmont..... | 36.3 | Steamburg..... | 96.2 |
| Belvidere..... | 39.4 | Randolph..... | 104.7 |
| Friendship.... | 44.0 | Kennedy..... | 112.1 |
| Cuba..... | 51.7 | Falconer..... | 118.5 |
| Hinsdale..... | 60.2 | Jamestown..... | 121.2 |

Jamestown-Westfield.

| Miles | | Miles | |
|----------------|-----|-----------------|------|
| Jamestown..... | 0.0 | Dewittville.... | 14.3 |
| Fluvanna..... | 4.0 | Hartfield..... | 17.0 |
| Bemus Point.. | 7.9 | Mayville..... | 19.0 |
| Bay View..... | 9.2 | Westfield..... | 25.3 |

SIDE TRIPS INTO VERMONT.

Ticonderoga, N. Y.-Brandon, Vt.
(Via Larrabee's Pt.) (Via Montcalm Ferry)

| Miles | | Miles | |
|-----------------|------|-----------------|------|
| Ticonderoga... | 0.0 | Ticonderoga.... | 0.0 |
| Ft. Ticond'ga.. | 2.0 | Montcalm Ferry | 1.9 |
| Larrabee's Pt. | 2.2 | Orwell..... | 7.8 |
| Orwell..... | 8.1 | Sudbury..... | 12.9 |
| Sudbury..... | 13.2 | Brandon..... | 26.6 |
| Brandon..... | 20.9 | | |

Saratoga Springs, N. Y.-Rutland, Vt.

| Miles | | Miles | |
|-----------------|------|-------------------|------|
| Saratoga Spgs.. | 0.0 | Comstock..... | 35.4 |
| Wilton..... | 7.5 | Whitehall..... | 42.6 |
| S. Glens Falls. | 17.9 | Fairhaven, Vt.. | 53.0 |
| Glens Falls... | 18.8 | Hydeville..... | 56.0 |
| Hudson Falls.. | 22.4 | Castleton Corners | 56.3 |
| Moss Street.... | 23.4 | Castleton..... | 57.9 |
| Kingsbury.... | 27.1 | West Rutland... | 65.0 |
| Fort Ann..... | 33.4 | Center Rutland.. | 67.2 |
| Dewey's Edge.. | 33.9 | Rutland..... | 68.9 |

Saratoga Springs, N. Y.-Manchester, Vt.

| Miles | | Miles | |
|-----------------|------|-----------------|------|
| Saratoga Spgs.. | 0.0 | Cambridge..... | 26.6 |
| Gravel Hill... | 2.1 | E. Salem..... | |
| | | (Eagleville)... | 31.3 |
| Grangerville... | 8.5 | W. Arlington... | 35.6 |
| Schuylerville.. | 11.3 | Arlington..... | 41.8 |
| Greenwich..... | 17.4 | Manchester..... | 51.9 |
| Coila..... | 24.6 | | |

Rouse's Point, N. Y.-Burlington, Vt.

| Miles | | Miles | |
|-----------------|------|-----------------|------|
| Rouse's Point.. | 0.0 | Georgia..... | 30.7 |
| Albany, Vt.... | 3.6 | Milton..... | 37.3 |
| East Albany... | 8.7 | Winooski..... | 50.3 |
| Swanton..... | 16.0 | Burlington..... | 52.9 |
| St. Albans.... | 24.7 | | |

PENNSYLVANIA ROUTES

NEW YORK-PHILADELPHIA.

New York-Atlantic City.

| Miles | | Miles |
|-------------------------|--------------------------|-------|
| New York..... 0.0 | Avon..... 66.7 | |
| Newark..... 8.9 | Belmont..... 67.4 | |
| Elizabeth..... 15.1 | Spring Lake..... 69.0 | |
| Rahway..... 20.7 | Seagirt..... 70.7 | |
| Perth Amboy..... 28.2 | Mansquan..... 71.7 | |
| South Amboy..... 32.3 | Brielle..... 72.7 | |
| Keyport..... 38.3 | Pt. Pleasant..... 74.3 | |
| Middletown..... 44.4 | Burrsville..... 78.7 | |
| Red Bank..... 49.3 | Lakewood..... 84.0 | |
| Shrewsbury..... 51.2 | Toms River..... 94.0 | |
| Eatontown..... 52.8 | Bayville..... 96.4 | |
| Long Branch..... 57.4 | Barnegat..... 110.4 | |
| West End..... 59.0 | Manahawken..... 115.2 | |
| Elberon..... 60.7 | Tuckerton..... 122.9 | |
| Deal..... 62.1 | New Gretna..... 129.6 | |
| Allenhurst..... 63.1 | Port Republic..... 136.3 | |
| Asbury Park..... 64.3 | Oceanville..... 140.7 | |
| Ocean Grove..... 65.2 | Absecon..... 144.2 | |
| Bradley Beach..... 65.7 | Atlantic City..... 153.5 | |

Atlantic City-Cape May.

| Miles | | Miles |
|------------------------|-------------------------|-------|
| Atlantic City..... 0.0 | Ocean View..... 26.8 | |
| Pleasantville..... 5.3 | Cape May C. H..... 35.6 | |
| Ocean City..... 14.9 | Rio Grande..... 41.5 | |
| Seaville..... 24.6 | Cape May..... 48.1 | |

Cape May-Philadelphia.

| Miles | | Miles |
|-------------------------|-------------------------|-------|
| Cape May..... 0.0 | Franklinville..... 62.4 | |
| Cape May C. H..... 13.1 | Clayton..... 65.0 | |
| Dennisville..... 22.0 | Glassboro..... 67.7 | |
| Eldora..... 27.0 | Hurffville..... 72.3 | |
| Leesburg..... 32.2 | Westville..... 80.0 | |
| Mauricetown..... 37.3 | Gloucester..... 80.9 | |
| Millville..... 46.8 | Camden..... 85.5 | |
| Vineland..... 53.3 | Philadelphia..... 85.5 | |

OPTIONAL.

New York City-Atlantic City, N. J.

| Miles | | Miles |
|--------------------------|--------------------------|-------|
| New York City..... 0.0 | Adelphia..... 41.2 | |
| St. George..... 0.3 | Lakewood..... 50.4 | |
| Tomkinsville..... 0.6 | Tom's River..... 60.1 | |
| Stapleton..... 1.3 | Bayville..... 64.4 | |
| New Dorp..... 0.0 | Lanoka..... 67.2 | |
| Gifford..... 8.6 | Forked River..... 69.4 | |
| Annandale..... 10.6 | Waretown..... 73.0 | |
| Huguenot..... 11.3 | Barnegat..... 76.2 | |
| Princes Bay..... 11.9 | Manahawken..... 80.5 | |
| Pleasant Pkns..... 12.7 | Cedar Run..... 81.5 | |
| Tottenville..... 14.8 | Mayetta..... 82.1 | |
| P. Amboy, N. J..... 15.5 | West Creek..... 85.5 | |
| South Amboy..... 18.7 | Parkertown..... 86.2 | |
| Morgan..... 21.3 | Tuckerton..... 88.4 | |
| Keyport..... 24.7 | New Gretna..... 94.5 | |
| Matawan..... 26.6 | Port Republic..... 101.0 | |
| Freneau..... 27.9 | Smithville..... 103.6 | |
| Morganville..... 29.5 | Oceanville..... 105.4 | |
| Wickatunk..... 31.3 | Absecon..... 109.3 | |
| Marlboro..... 33.8 | Pleasantville..... 111.8 | |
| Freehold..... 37.8 | Atlantic City..... 118.3 | |

New York City-Easton, Pa.

| Miles | | Miles |
|----------------------------------|------------------------|-------|
| New York City..... 0.0 | Far Hills..... 39.5 | |
| (Ferry to Wee- hawken, N. J.) | Pedminster..... 40.3 | |
| Union Hill..... 0.8 | Lamington..... 44.6 | |
| Jersey City..... 5.1 | White House..... 48.6 | |
| Newark..... 11.6 | Annandale..... 56.0 | |
| Irvington..... 15.1 | Clinton..... 57.7 | |
| Springfield..... 19.4 | Glen Gardner..... 62.4 | |
| Summit..... 22.5 | Hampton..... 63.4 | |
| West Summit..... 24.2 | Washington..... 68.1 | |
| New Providence..... 25.3 | Broadway..... 72.1 | |
| Berk's Heights..... 27.7 | New Village..... 74.2 | |
| W. Millington..... 32.2 | Phillipsburg..... 80.6 | |
| Liberty Corner..... 35.6 | Easton..... 81.1 | |

New York City-Philadelphia.

(Via Lincoln Highway.)

| Miles | | Miles |
|----------------------------------|---------------------------|-------|
| New York City..... 0.0 | Franklin Park..... 41.7 | |
| (Ferry to Wee- hawken, N. J.) | Kingston..... 48.4 | |
| Jersey City..... 5.2 | Princeton..... 51.3 | |
| Newark..... 11.8 | Lawrenceville..... 56.5 | |
| Elizabeth..... 17.3 | Trenton..... 62.7 | |
| Roselle..... 20.0 | Oxford Val., Pa..... 69.4 | |
| Rahway..... 23.7 | Langhorne..... 72.2 | |
| Iselin..... 27.2 | Bustleton..... 80.9 | |
| Metuchen..... 29.7 | Oxford Circle..... 83.4 | |
| New Brunswick..... 35.2 | Philadelphia..... 92.1 | |

Philadelphia-Gettysburg, Pa.

| Miles | | Miles |
|--------------------------|------------------------|-------|
| Philadelphia..... 0.0 | Vintage..... 53.1 | |
| Ardmore..... 0.2 | Williamstown..... 54.6 | |
| Bryn Mawr..... 11.0 | Paradise..... 55.6 | |
| Wayne..... 15.0 | Soudersburg..... 57.3 | |
| Stafford..... 15.6 | Lancaster..... 65.5 | |
| Berwyn..... 18.0 | Mountville..... 72.1 | |
| Paoli..... 20.4 | Columbia..... 76.2 | |
| Exton..... 27.8 | Wrightsville..... 77.7 | |
| Whitford..... 29.2 | Hallam..... 82.1 | |
| E. Downingtown..... 32.5 | Stony Brook..... 84.6 | |
| Downington..... 33.1 | York..... 89.4 | |
| Thorndale..... 35.4 | Thomasville..... 96.5 | |
| Coatesville..... 39.3 | Farmers..... 99.8 | |
| Sadsburyville..... 43.0 | Abbottstown..... 104.3 | |
| Gap..... 50.1 | New Oxford..... 106.4 | |
| Kinners..... 52.3 | Gettysburg..... 118.2 | |

Gettysburg, Pa.-Washington, D. C.

| Miles | | Miles |
|---------------------------|--------------------------|-------|
| Gettysburg..... 0.0 | Ridgeville..... 48.1 | |
| E'maltsburg, Md..... 10.5 | Damascus..... 54.1 | |
| Thurmont..... 18.3 | Cedar Grove..... 58.1 | |
| Lewistown..... 21.5 | Galthersburg..... 66.1 | |
| Hansonville..... 25.0 | Rockville..... 71.0 | |
| Harmony Grove..... 31.3 | Tennallytown..... 81.4 | |
| Frederick..... 34.2 | Wash'ton, D. C..... 97.5 | |
| New Market..... 32.1 | | |

Scranton-Delaware Water Gap, Pa.

| Miles | | Miles |
|----------------------|--------------------------|-------|
| Scranton..... 0.0 | Scot-Run..... 36.3 | |
| Elmhurst..... 9.0 | Tannersville..... 38.0 | |
| Moscow..... 12.3 | Bartonsville..... 41.3 | |
| Dalesville..... 14.6 | Stroudsburg..... 46.8 | |
| Tobyhanna..... 25.9 | E. Stroudsburg..... 47.2 | |
| Mt. Pocono..... 31.6 | Delaware W. G..... 51.3 | |
| Swiftwater..... 34.0 | | |

Erie-Pittsburgh, Pa.

| Miles | | Miles |
|-------------------------|--------------------------|-------|
| Erie..... 0.0 | Portersville..... 93.2 | |
| Cam. Springs..... 26.0 | Mid. Lancaster..... 99.0 | |
| Vernango..... 29.9 | Harmony..... 102.6 | |
| Sagertown..... 34.2 | Zellianople..... 104.3 | |
| Meadville..... 40.7 | Brush Creek..... 114.7 | |
| Custer..... 49.0 | Wexford..... 116.8 | |
| Sheakleyville..... 55.8 | Perrysville..... 124.3 | |
| Mercer..... 71.0 | Westview..... 125.8 | |
| Leesburg..... 77.7 | Pittsburgh..... 133.4 | |
| Harlansburgh..... 85.6 | | |

Pittsburgh-Uniontown, Pa.

| Miles | | Miles |
|------------------------|-----------------------|-------|
| Pittsburgh..... 0.0 | Kenneth..... 36.6 | |
| Clairton..... 16.6 | Brownsville..... 40.4 | |
| W. Elizabeth..... 18.4 | Davidson..... 43.6 | |
| Elizabeth..... 18.8 | Brier Hill..... 44.6 | |
| Hill Dale..... 20.6 | Searights..... 47.0 | |
| Fayette City..... 33.2 | Uniontown..... 52.4 | |
| Gillespie..... 34.5 | | |

WilkesBarre-Philadelphia, Pa.

| Miles | | Miles |
|--------------------------|----------------------------|-------|
| WilkesBarre..... 0.0 | Nazareth..... 65.1 | |
| Ashville Plains..... 5.2 | Bethlehem..... 74.7 | |
| Fairview..... 6.7 | Coopersburg..... 83.0 | |
| Bear Creek..... 16.7 | Quakertown..... 89.1 | |
| Stoddardsville..... 25.9 | Sellersville..... 95.6 | |
| Blakenlee..... 28.0 | Montgomeryville..... 104.8 | |
| Pocono..... 32.3 | Springhouse..... 109.4 | |

| | |
|---------------------------|----------------------------|
| Effort..... 42.1 | Ambler..... 111.7 |
| Broadheadsville..... 44.8 | Nat. Cemetery..... 120.4 |
| Saylorsburg..... 50.8 | N. Philadelphia..... 125.4 |
| Windgap..... 55.8 | Philadelphia..... 128.4 |
| Belfast..... 60.1 | |

Mercer-Pittsburgh, Pa.

| Miles | | Miles |
|-------------------------|-----------------------|-------|
| Mercer..... 0.0 | Hannastown..... 41.1 | |
| Blackstown..... 5.4 | Saxonsbury..... 45.0 | |
| Leesburg..... 7.3 | Cumberville..... 52.5 | |
| Grove City..... 7.5 | Derseyville..... 56.8 | |
| North Liberty..... 12.1 | Undercliffe..... 63.3 | |
| Slippery Rock..... 14.0 | Sharpsburg..... 64.8 | |
| Butler..... 32.3 | Pittsburgh..... 70.9 | |

Bedford-Pittsburgh, Pa.

| Miles | | Miles |
|-----------------------|--------------------------|-------|
| Bedford..... 0.0 | Long Bridge..... 51.6 | |
| Wolfsburg..... 2.6 | Youngstown..... 56.3 | |
| Schellburg..... 0.3 | Greensburg..... 66.5 | |
| Buckstown..... 22.5 | Grapeville..... 70.8 | |
| Kanter..... 27.5 | Adamsburg..... 72.9 | |
| Stoyestown..... 28.6 | Irwin..... 76.3 | |
| Farrellton..... 34.7 | Jacksonville..... 77.1 | |
| Jenner..... 35.2 | Circleville..... 77.7 | |
| Jennerstown..... 36.3 | El. McKeesport..... 83.4 | |
| Laughlinton..... 44.7 | Pittsburgh..... 97.7 | |
| Ligonier..... 47.7 | | |

Pittsburgh-Washington, Pa.

| Miles | | Miles |
|-----------------------|------------------------|-------|
| Pittsburgh..... 0.0 | Houston..... 21.4 | |
| Heidelberg..... 8.3 | McGovern..... 23.2 | |
| Woodville..... 9.3 | Meadow Lands..... 24.5 | |
| Bridgeville..... 10.7 | Washington..... 28.0 | |
| Canonsburg..... 19.5 | | |

Washington, Pa.-Cumberland, Md.

| Miles | | Miles |
|--------------------------|---------------------------|-------|
| Washington..... 0.0 | Hopwood..... 36.8 | |
| S. Strabane..... 5.1 | Mt. Washington..... 46.5 | |
| Glyre..... 6.7 | Farmingtown..... 47.9 | |
| Odell..... 9.0 | Thomas..... 58.0 | |
| Hillsboro..... 12.0 | Somerfield..... 58.4 | |
| Beallsville..... 15.0 | Addison..... 61.8 | |
| Centerville..... 17.8 | Keyser's R., Md..... 68.1 | |
| Malden..... 20.7 | Grantsville..... 73.7 | |
| W. Brownsville..... 23.1 | Frostburg..... 88.0 | |
| Brownsville..... 23.5 | Eckhart..... 90.3 | |
| Brier Hill..... 28.0 | Clarysville..... 90.5 | |
| Uniontown..... 34.6 | Cumberland..... 99.0 | |

Cumberland-Hagerstown, Md.

| Miles | | Miles |
|----------------------|-------------------------|-------|
| Cumberland..... 0.0 | Indian Spring..... 49.5 | |
| Flintstone..... 12.9 | Clear Spring..... 54.0 | |
| Gilpin..... 14.0 | Wilson..... 58.1 | |
| Hancock..... 38.3 | Hagerstown..... 65.3 | |
| Millstone..... 44.2 | | |

Cumberland, Pa.-Wheeling, W. Va.

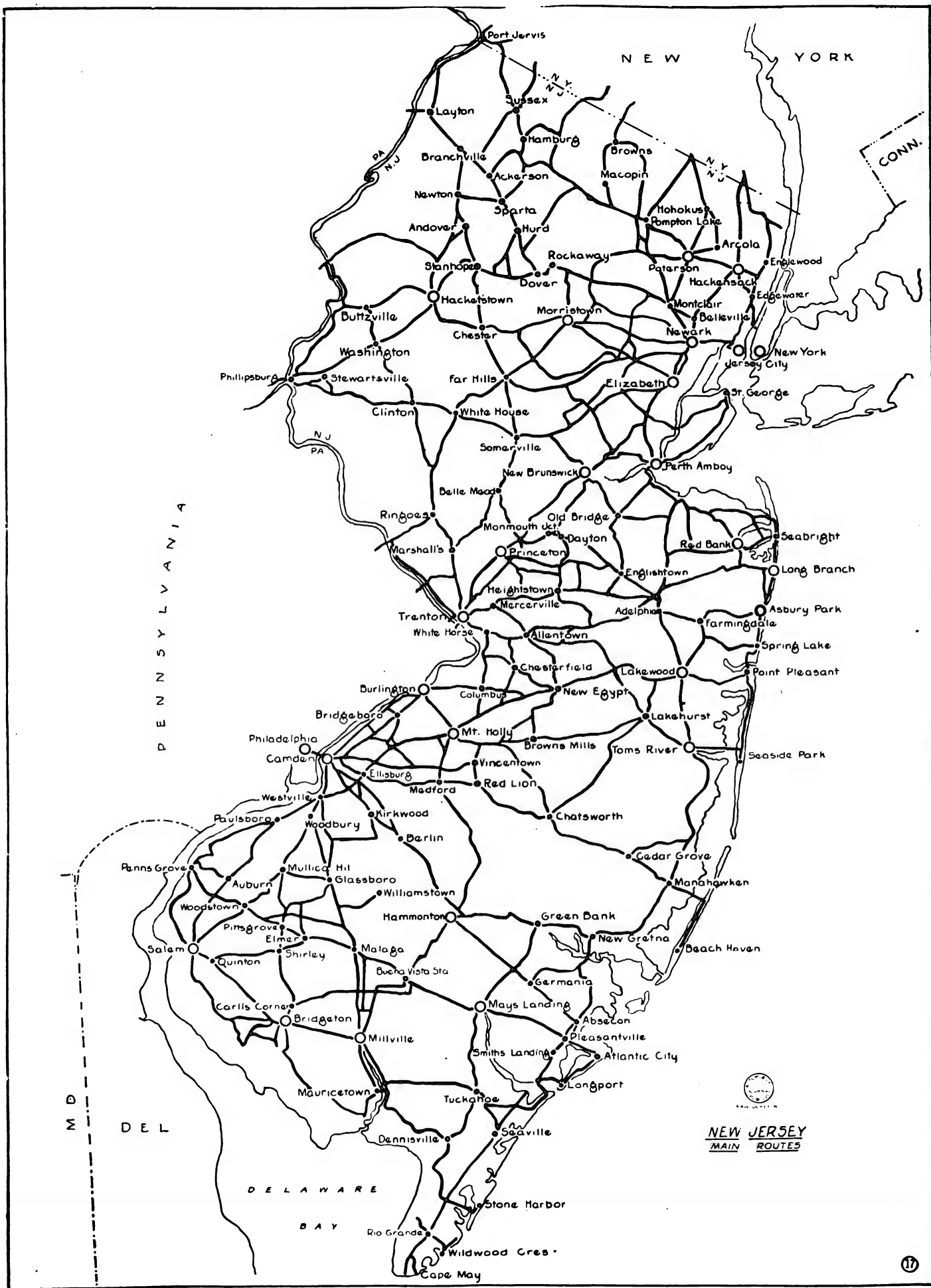
| Miles | | Miles |
|------------------------|---------------------------|-------|
| Cumberland..... 0.0 | Summit..... 56.0 | |
| Frostburg..... 11.0 | Uniontown..... 62.0 | |
| Grantville..... 25.0 | Brownsville..... 74.0 | |
| Keyser Ridge..... 31.0 | Scenery Hill..... 86.0 | |
| Addison..... 36.0 | Washington..... 99.0 | |
| Somerfield..... 40.0 | Claysville..... 100.0 | |
| Farmington..... 50.0 | Wheel'g, W. Va..... 132.0 | |

Wheeling, W. Va.-Pittsburgh, Pa.

| Miles | | Miles |
|--------------------------|-----------------------|-------|
| Wheeling..... 0.0 | Morgansa..... 43.2 | |
| Claysville, Pa..... 23.0 | Bridgeville..... 50.8 | |
| Washington..... 33.0 | Carnegie..... 54.8 | |
| Cannonsburg..... 41.2 | Pittsburgh..... 62.1 | |

Washington, D. C.-Richmond Va.

| Miles | | Miles |
|--------------------------|--------------------------|-------|
| Washington..... 0.0 | Spottsylvania..... 75.8 | |
| Accotink, Va..... 19.3 | Snell..... 80.0 | |
| Lorton..... 23.5 | Patlow..... 90.7 | |
| Ocoquan..... 27.0 | Chilesburg..... 94.6 | |
| Dumfries..... 37.6 | Teman Station..... 100.6 | |
| Garrisonville..... 48.3 | Oliver..... 110.3 | |
| Falmouth..... 63.0 | Ashland..... 119.7 | |
| Fredericksburg..... 64.4 | Richmond..... 135.7 | |





Richmond, Va.-Raleigh, N. C.

| Miles | Miles |
|-----------------------|--------------------------|
| Richmond..... 0.0 | Clarksville..... 110.7 |
| Manchester..... 2.0 | Soudan..... 116.2 |
| Petersburg..... 22.4 | Bullock, N. O..... 122.0 |
| Dinwiddie..... 37.8 | Stovall..... 125.3 |
| Butterworth Sta. 40.7 | Lewis..... 130.5 |
| Dewitt Station. 42.3 | Oxford..... 135.0 |
| Cochran..... 64.5 | Franklin..... 156.5 |
| South Hill..... 80.4 | Youngsville..... 164.1 |
| Baskerville Sta. 91.0 | Wake Forest..... 168.8 |
| Antler's Station 94.8 | Raleigh..... 184.6 |
| Boydton..... 99.7 | |

New York City-Delaware Water Gap, Pa.

| Miles | Miles |
|-----------------------------|-------------------------|
| New York City 0.0 | Chester..... 44.6 |
| (Ferry to Weehawken, N. J.) | German Valley..... 49.1 |
| North Bergen... 1.4 | Schooley's Mt'n 51.7 |
| Jersey City... 5.2 | Hackettstown... 55.8 |
| Newark..... 11.8 | Vienna..... 59.8 |
| Irvington..... 15.8 | Great Meadows. 61.0 |
| Vaux Hall..... 18.4 | Buttsville..... 68.4 |
| Springfield... 20.2 | Bridgeville..... 70.4 |
| Chatham..... 24.8 | Delaware..... 74.3 |
| Madison..... 27.0 | Portland, Pa.... 77.5 |
| Morristown.... 31.7 | Slateford..... 79.3 |
| Mendham..... 38.7 | Del. Water Gap 82.9 |

Binghamton, N. Y.-Scranton, Pa.

| Miles | Miles |
|----------------------|-----------------------|
| Binghamton... 0.0 | Nicholson..... 43.0 |
| Langdon..... 6.7 | Factoryville.... 48.1 |
| Kirkwood..... 8.8 | La Plume..... 49.9 |
| Great Bend, Pa. 14.3 | Dalton..... 51.8 |
| Hallstead..... 14.9 | Glenburn..... 53.0 |
| New Milford... 20.9 | Clark's Summit. 55.2 |
| Heart Lake.... 25.5 | Chinchilla..... 57.2 |
| Brooklyn..... 33.3 | Scranton..... 62.0 |
| Foster..... 37.2 | |

Port Chester, N. Y.-Newark, N. J.

| Miles | Miles |
|---------------------|---------------------|
| Port Chester... 0.0 | Hillsdale..... 26.5 |
| White Plains... 6.3 | Westwood..... 27.4 |
| Elmsford..... 9.7 | Emerson..... 28.8 |
| Tarrytown.... 13.0 | Oradelle..... 30.3 |

| | |
|----------------------|----------------------|
| Nyack..... 13.9 | River Edge..... 31.3 |
| West Nyack.... 16.4 | Hackensack..... 35.2 |
| Nanuet..... 19.4 | Woodbridge..... 39.5 |
| Pearl River.... 22.2 | Carlstadt..... 40.2 |
| Montvale, N. J. 23.6 | Rutherford..... 41.1 |
| Park Ridge.... 24.4 | Lyndhurst..... 42.3 |
| Woodcliff Lake 25.2 | Newark..... 49.3 |

Elmira, N. Y.-Scranton, Pa.

| Miles | Miles |
|----------------------|-----------------------|
| Elmira..... 0.0 | Sugar Run..... 57.2 |
| Lowman..... 6.7 | Hollenbeck..... 60.6 |
| Chemung..... 12.8 | Jenningsville... 68.9 |
| Waverly..... 17.3 | Maheopany..... 75.2 |
| Sayre, Pa..... 20.1 | Eatonville..... 83.8 |
| Athens..... 22.0 | Tunkhannock... 85.9 |
| Green's Land'g. 24.2 | La Grange..... 91.1 |
| Milan..... 25.9 | Lake Wynola.... 93.5 |
| Ulster..... 30.3 | Mill City..... 95.3 |
| North Towanda 37.0 | Shultsville.... 100.9 |
| Towanda..... 38.6 | Clarke Summit. 104.7 |
| Wysox..... 41.4 | Chinchilla..... 106.3 |
| Durrell..... 45.8 | Providence..... 110.0 |
| Terrytown.... 53.4 | Scranton..... 112.7 |

Elmira, N. Y.-WilkesBarre, Pa.

| Miles | Miles |
|----------------------|----------------------|
| Elmira..... 0.0 | Laceyville..... 63.6 |
| Wellburg..... 6.9 | Mesheppen..... 71.0 |
| Chemung..... 14.1 | Russell Hill... 74.7 |
| Waverly..... 18.6 | Tunkhannock... 80.0 |
| Athens, Pa.... 22.2 | Peterboro..... 88.5 |
| Ulster..... 30.3 | Bowman Creek. 91.4 |
| Towanda..... 34.4 | Beaumont..... 93.5 |
| Wysox..... 41.0 | Kunkle..... 95.9 |
| Standing Stone. 45.2 | Dallas Station. 99.1 |
| Rummerfield... 48.1 | Luzerne..... 105.5 |
| Wyalusing.... 55.2 | WilkesBarre... 108.6 |

Port Jervis, N. Y.-Easton, Pa.

| Miles | Miles |
|----------------------|----------------------|
| Port Jervis... 0.0 | Portland..... 44.9 |
| Milford, Pa.... 7.0 | Mt. Bethel.... 46.4 |
| Dingman's F'y. 15.6 | Stone Church... 49.2 |
| Egypt Mills... 24.0 | Richmond..... 51.0 |
| Bushkill..... 27.4 | Mt. Pleasant... 53.9 |
| Shawnee..... 36.3 | Martin's Creek. 56.1 |
| N. Water Gap... 38.3 | Sand's Eddy.... 58.0 |
| Del. Water Gap 39.5 | Easton..... 63.8 |
| Slateford..... 43.1 | |

Philadelphia, Pa.-Washington, D. C.

| Miles | Miles |
|-----------------------|------------------------|
| Philadelphia... 0.0 | Aberdeen..... 70.5 |
| Darby..... 8.2 | Churchville.... 76.9 |
| Norwood..... 11.1 | Bel Air..... 82.3 |
| Chester..... 15.6 | Kingsville.... 89.8 |
| Marcus Hook... 19.6 | Perry Hall..... 92.8 |
| Wilmington, Del. 28.4 | Overlea..... 96.4 |
| Elasmere Jun'cn 31.3 | Baltimore..... 103.6 |
| Marshalltown... 34.1 | Elkridge..... 114.1 |
| Newark Center 41.7 | Laurel..... 126.1 |
| Newark..... 42.3 | Muirkirk..... 128.8 |
| Elkton, Md.... 48.9 | Ammendale..... 129.9 |
| Northeast..... 55.1 | Beltville..... 131.0 |
| Charlestown... 58.1 | Hyattsville.... 137.4 |
| Principio..... 61.6 | Bladensburg... 138.2 |
| Perryville.... 64.3 | Wash'gton, D. C. 143.3 |
| Havre De Grace 65.2 | |

Philadelphia-Easton, Pa.

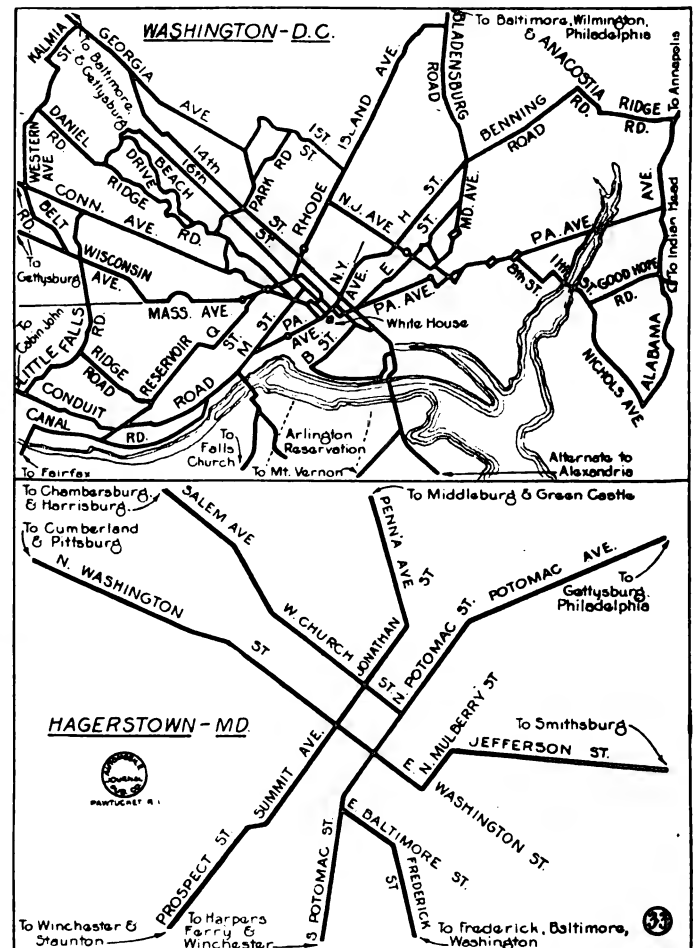
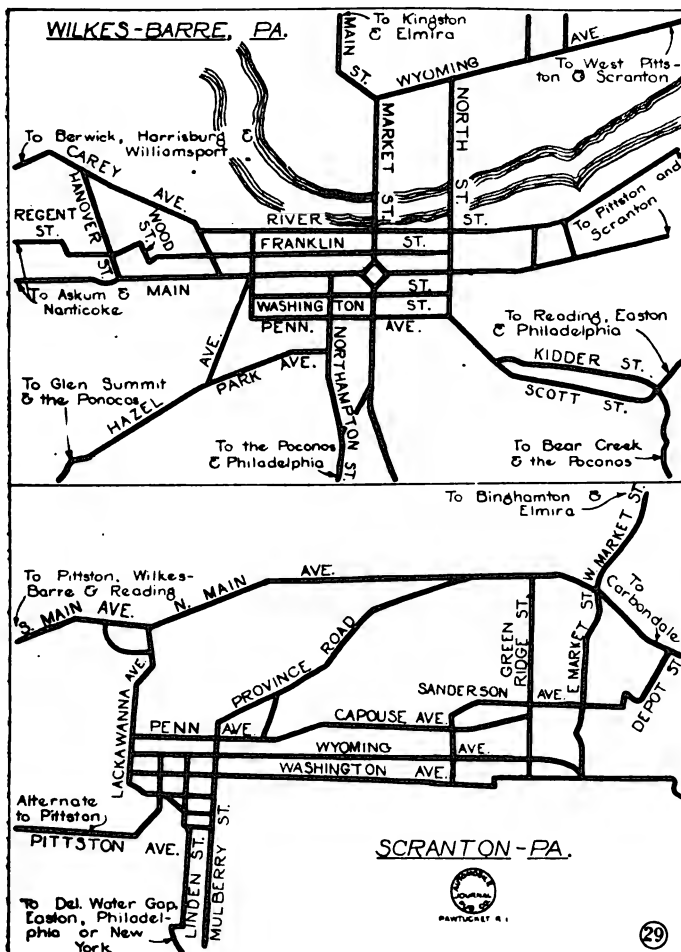
| Miles | Miles |
|----------------------|-----------------------|
| Philadelphia... 0.0 | Piperville..... 34.8 |
| Ogontz..... 8.6 | Ottaville..... 38.3 |
| Jenkintown... 10.4 | The Harrows... 40.1 |
| Abington..... 11.5 | Revere..... 41.9 |
| Willow Grove.. 13.8 | Ferndale..... 43.4 |
| Warrington... 21.8 | Kintnersville... 45.3 |
| Turk..... 24.5 | Lehensburg.... 46.9 |
| Doylestown... 26.1 | Riegelville.... 48.5 |
| Danboro..... 29.3 | Raunsville.... 52.0 |
| Plumsteadville. 31.8 | Easton..... 57.6 |

Philadelphia-Phoenixville, Pa.

| Miles | Miles |
|---------------------|------------------------|
| Philadelphia... 0.0 | Jeffersonville... 19.1 |
| Fairmount P'k. 1.0 | Audubon..... 22.4 |
| Wissahickon... 5.9 | Oaks..... 23.4 |
| Barren Hill... 11.4 | Port Providence 25.8 |
| Harmonville... 13.4 | Montclare.... 26.6 |
| Norristown.... 16.7 | Phoenixville... 27.1 |

Philadelphia-Reading, Pa.

| Miles | Miles |
|----------------------|----------------------|
| Philadelphia... 0.0 | Pottstown..... 39.3 |
| Barren Hill... 13.7 | Douglasville... 43.8 |
| Fairview..... 22.9 | Reading..... 54.4 |
| Collegeville... 37.3 | |



Reading-Harrisburg, Pa.

| Miles | Miles |
|----------------------|-----------------------|
| Reading..... 0.0 | Lebanon..... 28.3 |
| Robesonia..... 12.0 | Palmyra..... 37.4 |
| Womelsdorf..... 14.5 | Hershey..... 40.7 |
| Waterloo..... 17.3 | Swatara..... 41.5 |
| Myerstown..... 21.3 | Hummelstown..... 44.0 |
| Avon..... 26.1 | Harrisburg..... 53.4 |

Harrisburg-Gettysburg, Pa.

| Miles | Miles |
|-----------------------|------------------------|
| Harrisburg..... 0.0 | Clear Spring..... 17.0 |
| Camp Hill..... 3.2 | York Springs..... 23.3 |
| Shepardstown..... 9.3 | Heidlersburg..... 27.5 |
| Dillsburg..... 14.6 | Gettysburg..... 37.0 |

Gettysburg-Bedford, Pa.

| Miles | Miles |
|---------------------------|--------------------------|
| Gettysburg..... 0.0 | Fort London..... 38.0 |
| Seven Stars..... 3.8 | McConnellsburg..... 45.9 |
| McKnightstown..... 5.8 | Harrisville..... 52.3 |
| Cashtown..... 7.7 | Mellinville..... 62.7 |
| Black Gap..... 15.7 | Breeswood..... 63.7 |
| Fayetteville..... 18.3 | Everett..... 72.0 |
| W. Fayetteville..... 19.8 | The Willows..... 76.7 |
| Chambersburg..... 24.5 | Bedford..... 80.0 |
| St. Thomas..... 32.0 | |

Gettysburg, Pa.-Staunton, Va.

| Miles | Miles |
|---------------------|-----------------------|
| Gettysburg..... 0.0 | Strassburg..... 105.3 |

| | |
|---------------------------|--------------------------|
| Fairfield..... 8.1 | Tom's Brook..... 111.0 |
| Charman Sta'n..... 15.2 | Maurertown..... 112.5 |
| Rouersville..... 18.5 | Woodstock..... 116.6 |
| Waynesboro..... 21.6 | Edinburg..... 121.8 |
| Leitersburg..... 27.0 | Mt. Jackson..... 129.2 |
| Hagerstown..... 33.3 | Newmarket..... 136.7 |
| Tilghmantown..... 41.5 | Lacey Springs..... 145.5 |
| Antietam B'f'ds..... 45.8 | Harrisburg..... 153.8 |
| Sharpsburg..... 47.3 | Mt. Crawford..... 161.9 |
| Antietam Sta'n..... 48.7 | Burkstown..... 164.7 |
| Shep'tn, W. Va..... 50.9 | Mt. Sydney..... 169.7 |
| Halltown Sta..... 59.8 | Willow Spout..... 171.7 |
| Charlestown..... 63.5 | Verona..... 174.0 |
| Berryville, Va..... 76.2 | Staunton..... 180.9 |
| Winchester..... 86.9 | |

CANADIAN TOURS

ITINERARIES.

Portland-Augusta, Me., 64.8 Miles.

| Miles | Miles |
|---------------------------|----------------------|
| Portland, Me..... 0.0 | Auburn..... 33.5 |
| Morrill's Corn'r..... 3.1 | Lewiston..... 33.9 |
| Allen's Corner..... 4.0 | Greene..... 41.9 |
| Gray..... 17.1 | Winthrop..... 54.4 |
| North Gray..... 19.5 | Manchester..... 60.3 |
| Upper Glou'ter..... 24.8 | Augusta..... 64.8 |

Augusta-Lake Parlin, Me., 97 Miles.

| Miles | Miles |
|----------------------|-------------------|
| Augusta, Me..... 0.0 | Solon..... 50.1 |
| Waterville..... 19.6 | Bingham..... 58.0 |

| | |
|-------------------------|-----------------------|
| Fairfield Cen..... 23.7 | Carratunk..... 73.9 |
| Skowhegan..... 36.0 | The Forks..... 81.3 |
| Lakewood..... 41.7 | Lake Parlin..... 97.0 |

Lake Parlin, Me.-Quebec, P. Q., 121 Miles.

| Miles | Miles |
|--------------------------|---------------------------|
| Lake P'lin, Me..... 0.0 | Des Plantes..... 71.4 |
| Jackman..... 12.7 | St. Joseph..... 77.8 |
| Moose River..... 14.2 | Benue Junction..... 83.1 |
| Line House..... 28.4 | St. Marie..... 90.1 |
| Armstr'g, P. Q..... 39.4 | Scott Junction..... 95.2 |
| Jersey..... 56.1 | St. Henri..... 109.9 |
| St. George..... 58.0 | Levis-Que. Fer..... 120.6 |
| Gilbert..... 65.0 | Quebec..... 121.0 |
| Beauceville..... 67.9 | |

Quebec-Montreal, P. Q., 176.7 Miles.

| Miles | Miles |
|---------------------------------|-------------------------|
| Quebec, P. Q..... 0.0 | Three Rivers..... 79.6 |
| St. Augustin..... 14.3 | Pointe du Lac..... 88.7 |
| Les Escureils..... 28.5 | Yamachiche..... 97.0 |
| Cap Sante..... 32.7 | Maskinonge..... 111.1 |
| Fortneuf..... 37.8 | Berthier..... 125.3 |
| Deschambault..... 42.0 | Lamoraie..... 134.5 |
| La Chevrotiere..... 46.8 | Lavaltrie..... 140.6 |
| Grandines..... 49.1 | St. Sulpice..... 146.3 |
| St. Anne de la Parade..... 57.9 | L'Assomption..... 151.5 |
| Champlain..... 66.0 | Charlemagne..... 160.2 |
| C'p de la M'tine..... 75.7 | Montreal..... 176.7 |

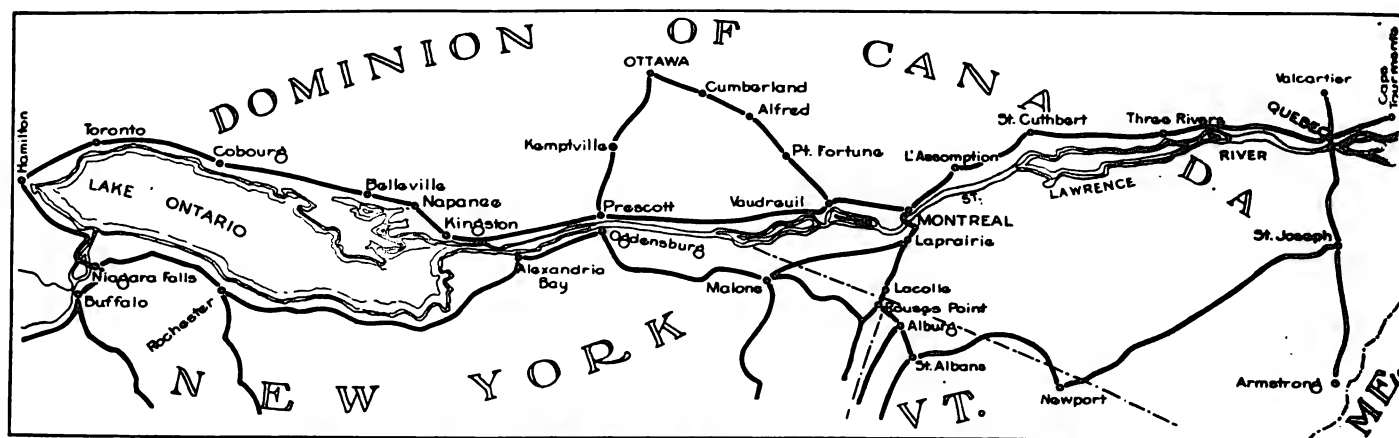


Chart of Route Encircling Lake Ontario and the Upper St. Lawrence Valley.

Newport, Vt.-Quebec, P. Q., 177.8 Miles.

| Miles | Miles |
|-----------------------|-----------------------|
| Newport, Vt. 0.0 | Coleraine 97.5 |
| Derby 5.1 | Thetford Mines 108.2 |
| Stanstead, P. Q. 11.0 | Robertson Sta. 113.4 |
| Cassville 17.1 | Reedham 115.3 |
| Massawippi 29.5 | Kinnear's Mills 123.8 |
| Lennoxville 39.7 | Leeds 130.0 |
| Ascot 55.2 | Parkhurst 139.8 |
| S. Dudswell 57.4 | St. Gilles 148.4 |
| Marbleton 66.8 | St. Etienne 160.3 |
| Weeden 75.7 | Chaudiere 165.6 |
| Garthby 86.6 | Levis 173.5 |
| D'Israeli 91.7 | Quebec 177.8 |

Montreal-Ottawa, Can.

| Miles | Miles |
|----------------------|------------------|
| Montreal 0.0 | Hawkesbury 61.9 |
| St. Laurent 6.9 | Lorignal 65.0 |
| Borde a Plouffe 11.0 | Cassaburn 67.5 |
| St. Martin 12.6 | Alfred 77.5 |
| St. Eustace 20.5 | Plantagenet 84.5 |
| St. Benoit 31.8 | Wendover 90.5 |
| St. Placide 38.2 | Clarence 96.0 |
| St. Andrew's E. 46.6 | Rockland 98.5 |
| Carrillon (Fry) 48.9 | Cumberland 103.5 |
| Point Fortune 49.0 | Orleans 110.5 |
| Little Rideau 54.2 | Ottawa 121.0 |

Montreal, P. Q.-Kingston, Ont.

| Miles | Miles |
|--------------|------------------|
| Montreal 0.0 | Morrisburg 107.1 |
| Lachine 7.4 | Iroquois 115.1 |

| | |
|-------------------------------|-------------------|
| St. Anne's (Fry) 23.1 | Cardinal 120.5 |
| Iale Perrot (m'land fry) 30.5 | Prescott 130.0 |
| Cascade Point 33.1 | Brockville 142.2 |
| Lancaster 63.4 | Lyn Village 145.5 |
| Cornwall 80.2 | Gannaque 175.8 |
| Aultsville 98.2 | Kingston 184.4 |

Kingston-Toronto, Ont.

| Miles | Miles |
|-------------------|-------------------|
| Kingston 0.0 | Coborg 93.8 |
| Cataragui 3.6 | Port Hope 101.2 |
| Napanee 25.5 | Bowmanville 122.8 |
| Marysville 33.9 | Orhawa 132.2 |
| Shannonville 40.6 | Whitby 136.4 |
| Belleville 49.4 | Pickering 142.5 |
| Trenton 60.7 | Toronto 165.0 |
| Colborne 78.4 | |

Toronto-Hamilton, Ont.

| Miles | Miles |
|---------------------|----------------|
| Toronto 0.0 | Freeman 38.8 |
| Cooksville 16.3 | Aldershot 41.6 |
| Trafalgar Vil. 24.7 | Hamilton 47.0 |
| Appleby 35.0 | |

Calais, Me.-St. John, N. B., 81.9 Miles.

| Miles | Miles |
|-----------------------|---------------------|
| Calais, Me. 0.0 | Musquash 64.3 |
| St. Steph., N. B. 0.4 | Spruce L. Sta. 74.0 |
| Oak Bay 7.0 | Fairville 78.0 |
| St. George 35.8 | St. John 81.9 |
| Lepreaux 55.7 | |

Houlton, Me.-Woodstock, N. B., 14.7 Miles.

| Miles | Miles |
|-------------------|-----------------------|
| Houlton, Me. 0.0 | Woodstock, N. B. 14.7 |
| Richmond Cor. 7.8 | |

Woodstock-Fredericton, N. B., 63.4 Miles.

| Miles | Miles |
|--------------------|---------------------|
| Woods'k, N. B. 0.0 | Prince William 41.5 |
| Meductic 12.8 | Hammondville 47.2 |
| Hawshaw 26.3 | Fredericton 63.4 |

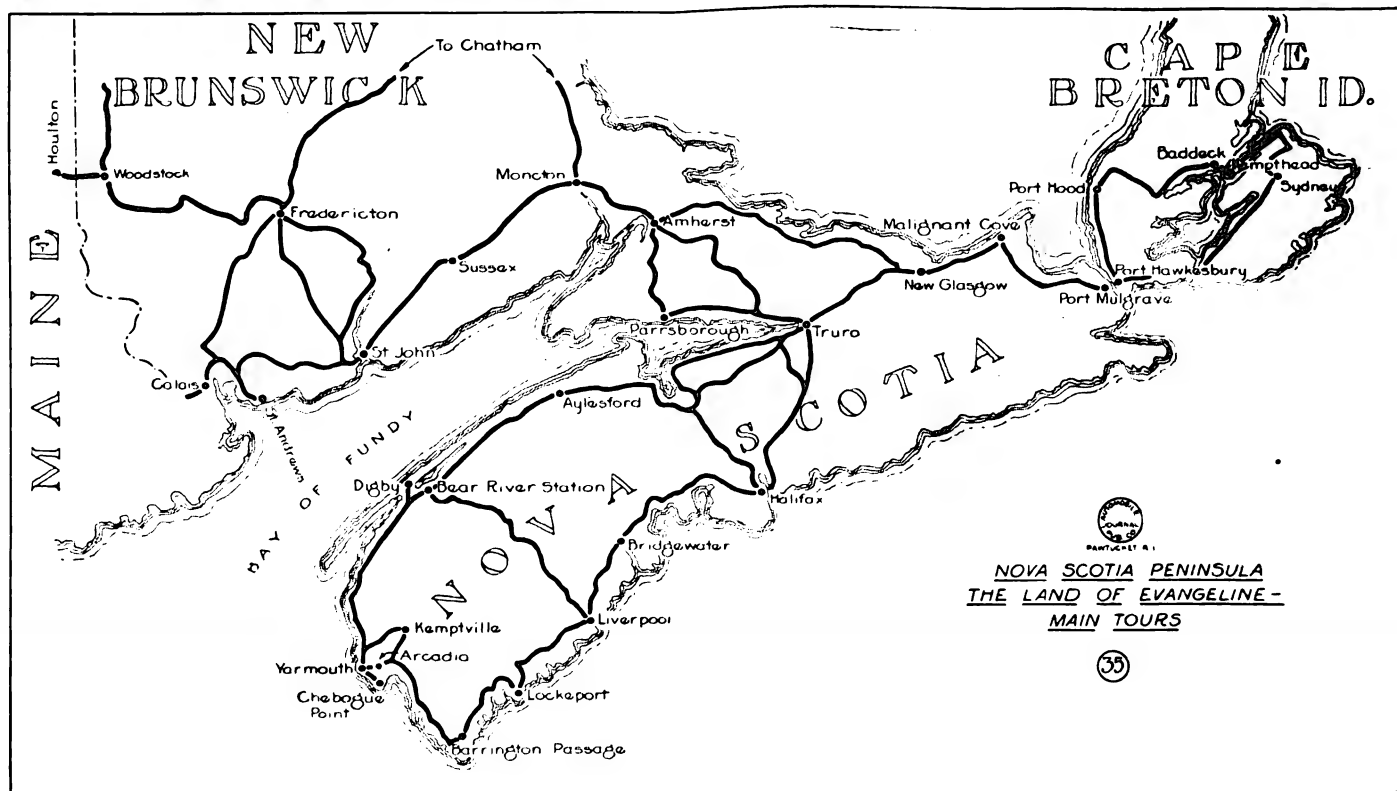
St. John-Fredericton, N. B., 66.6 Miles.

(Via the Broad Road.)

| Miles | Miles |
|---------------------|------------------|
| St. John, N. B. 0.0 | Welsford 24.7 |
| Fairville 2.9 | Petersville 33.2 |
| Grand Bay 10.5 | Oromocto 54.2 |
| Westfield B'ch 14.5 | Fredericton 66.6 |

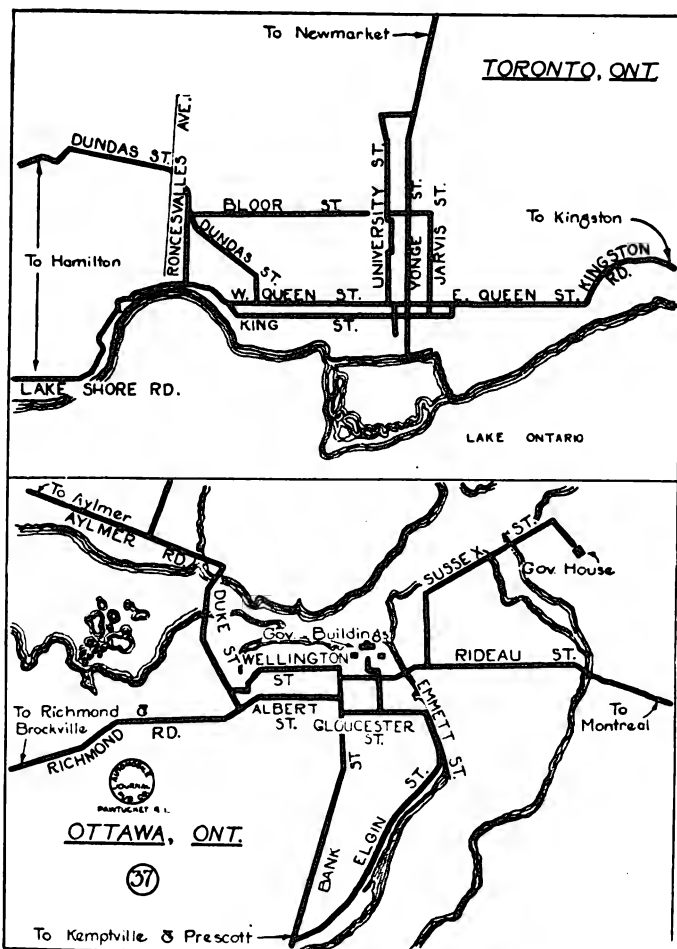
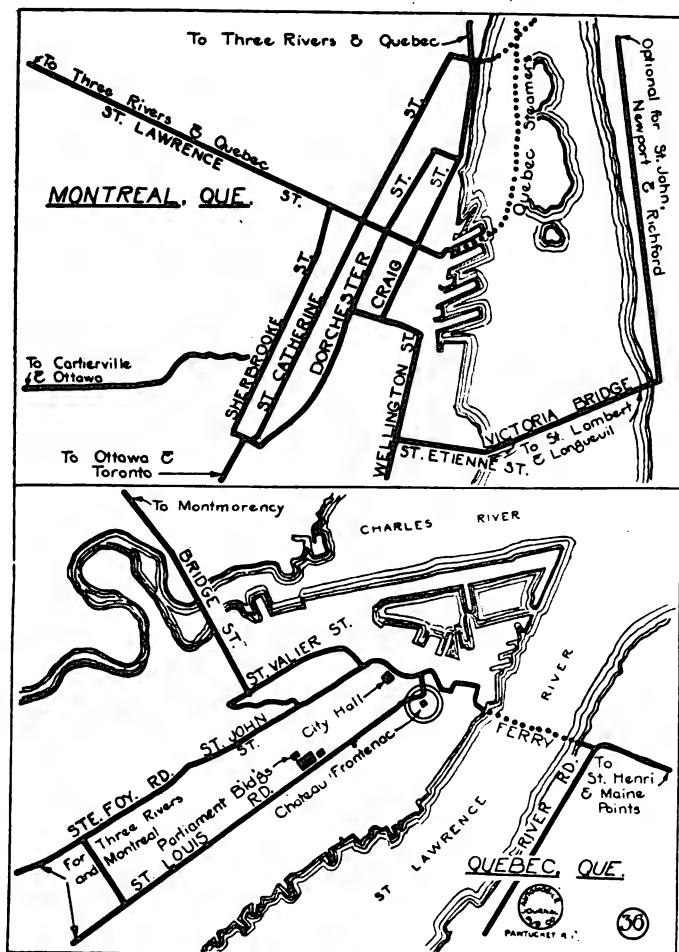
St. John, N. B.-Amherst, N. S., 132.8 Miles.

| Miles | Miles |
|---------------------|---------------------|
| St. John, N. B. 0.0 | Petitcodiac 68.7 |
| Brookville 4.7 | River Glade 73.9 |
| Ter'burn Sta. 5.8 | Salisbury 78.8 |
| Riverside Sta. 7.4 | Boundary Creek 82.1 |
| Rothsay 8.9 | Moncton 82.8 |
| Nauwigewauk 17.0 | St. Anselme 96.8 |
| Lakeside Sta. 20.9 | Memramcook 104.3 |



NOVA SCOTIA PENINSULA
THE LAND OF EVANGELINE -
MAIN TOURS

(33)



| | | | |
|----------------|------|---------------------|-------|
| Hampton..... | 22.2 | Up. Dorchester..... | 111.4 |
| Norton..... | 33.5 | Dorchester..... | 114.5 |
| Apoahqui..... | 40.0 | Sackville..... | 123.6 |
| Sussex..... | 45.0 | Au Lac Sta., N.S. | 127.4 |
| Monopolus..... | 53.5 | Amherst..... | 132.3 |

Amherst-Truro, N. S., 74.9 Miles. (Via Wentworth Valley.)

| Miles | Miles |
|------------------------|---------------------|
| Amherst, N. S. ... 0.0 | Glenholme..... 61.0 |
| Oxford..... 22.1 | Masstown..... 64.3 |
| South Victoria. 32.5 | Lower Onslow.. 68.3 |
| Wentworth.... 41.4 | Truro..... 74.9 |
| Folleigh Sta. . 50.3 | |

Amherst-New Glasgow, N. S., 97.2 Miles.

| Miles | Miles |
|----------------------|----------------------|
| Amherst..... 0.0 | Tatamagouch... 53.2 |
| Trucanville.. 6.9 | Brule..... 60.0 |
| Head of Amh't. 12.2 | River John..... 65.9 |
| Port Howe.... 25.4 | Poplar Hill.... 74.6 |
| Pugwash..... 30.4 | Meadowville... 76.0 |
| Wallace Bay... 36.6 | Scotburn..... 81.3 |
| Head of Wal. B. 38.5 | Durham..... 85.1 |
| Wallace..... 40.7 | Alma..... 90.5 |
| Wallace Ridge. 44.5 | New Glasgow.. 97.2 |

Amherst-Truro, N. S., 92.4 Miles. (Via Parrsboro.)

| Miles | Miles |
|------------------------|--------------------|
| Amherst, N. S. ... 0.0 | Lower Economy 53.6 |

| | |
|----------------------|----------------------|
| Nappan Station. 6.4 | Economy..... 57.7 |
| Maccan..... 9.0 | Bass River..... 64.9 |
| Athol..... 13.8 | Portaplique.... 68.2 |
| Westbrook.... 23.2 | Great Village.. 74.8 |
| Parrsboro.... 35.5 | Glenholme..... 78.2 |
| Moose River... 43.8 | Magstown..... 81.1 |
| Low. Five Isl's 47.6 | Lower Onslow.. 85.8 |
| Five Islands.. 50.7 | Truro..... 92.4 |

Truro-New Glasgow, N. S., 40.6 Miles.

| Miles | Miles |
|----------------------|----------------------|
| Truro, N. S. ... 0.0 | Green Hill..... 31.3 |
| Kempton..... 12.9 | Alma..... 33.9 |
| Salt Spring... 24.9 | New Glasgow... 40.6 |

Truro-Halifax, N. S., 65 Miles.

| Miles | Miles |
|----------------------|---------------------|
| Truro, N. S. ... 0.0 | Elmsdale..... 34.3 |
| Hilden..... 4.9 | Enfield..... 36.8 |
| Brookfield.... 8.7 | Wellington.... 43.7 |
| Brentwood.... 11.0 | Waverly..... 50.3 |
| Alton..... 13.7 | Bedford..... 55.7 |
| Stewiacke.... 18.8 | Rockingham... 60.9 |
| Shubenacadie.. 23.4 | Halifax..... 65.0 |

Halifax-Digby, N. S., 152 Miles.

| Miles | Miles |
|------------------------|----------------------|
| Halifax, N. S. ... 0.0 | Waterville..... 79.5 |
| Rockingham... 4.2 | Berwick..... 83.0 |

| | |
|--|-----------------------|
| Bedford..... 9.3 | Aylsford..... 88.2 |
| Sackville..... 13.0 | Anbura..... 90.1 |
| Mt. Uniacke... 25.3 | Kingston..... 94.6 |
| Newport Cor.. 35.4 | Willmot..... 99.4 |
| St. Croix..... 38.5 | Middleton..... 101.7 |
| Newport Sta.. 39.6 | Lawrencetown.. 108.0 |
| Windsor..... 45.2 | Paradise..... 110.8 |
| Huntsport.... 52.3 | Bridgetown... 115.6 |
| Grand Pre.... 60.3 | Tupperville... 120.9 |
| (Road from here goes to Evangeline Beach and other interesting places) | Round Hill.... 123.9 |
| Wolfville..... 63.0 | Annapolis Roy'l 130.6 |
| Kentville..... 70.5 | Clementsport . 138.7 |
| Coldbrook.... 75.1 | Deep Brook.... 141.7 |
| Cambridge.... 77.8 | Bear River.... 144.9 |
| | Smith's Cove.. 145.7 |
| | Digby..... 152.0 |

Digby-Yarmouth, N. S., 66.5 Miles.

| Miles | Miles |
|----------------------|-------------------------|
| Digby, N. S. ... 0.0 | Saintinterville... 34.1 |
| Barton..... 9.0 | Low. Sauln'ville 35.2 |
| Plympton..... 12.0 | Meteghan River 37.0 |
| Gilbert Cove.. 13.9 | Meteghan..... 39.5 |
| Ashmore..... 15.8 | Mavillette.... 46.2 |
| Weymouth N.. 18.1 | Salmon River... 48.9 |
| Weymouth.... 19.9 | Beaver River... 53.4 |
| Belliveau.... 24.6 | Port Maitland.. 55.0 |
| Church Point.. 28.3 | Hebron..... 62.4 |
| Little Brook.. 31.0 | Yarmouth..... 66.5 |
| Comenauville.. 32.0 | |

ACCESSORIES DEPARTMENT

Universal One-Piece Piston Ring is said to overcome many of the objectionable features with which the modern gas engine is afflicted. It has found decided favor with all the motorists who have had this type of ring installed it is said, and continues to grow in popularity con-

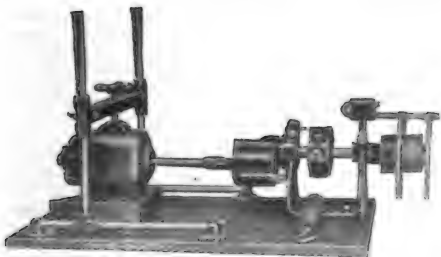


stantly. The ring is made with a bevel grooved outer top edge in which the collection of the oil takes place, the sides of this groove are sloped in such a way that the oil is wiped back between the ring and cylinder wall at each upward movement of the piston, and is forced down again on the return stroke by the square face of the ring's lower edge.

These one-piece rings are said to force the oil that is ordinarily burned in the combustion chamber back between the rings and cylinder walls, thus making it perform its full lubricating duty. A central oil groove with which the ring is fitted is said to be kept adequately filled with oil at all times. The price of these rings varies according to size, from 65 cents to \$1 each.

Manufactured by Universal Machine Company, Baltimore, Md.

Reliance Test Unit is a low priced and extremely practical machine for testing starters, generators and magnetos. This machine makes it possible for the repair



man to repair and test without going to the trouble of installing in the car each

time a test is necessary, it is stated. The chief features of the Reliance Test Unit are low price, simple construction and general adaptability to the needs of the average shop. It has a special feature in that Ford F. A. generators mesh directly into the drive and can be turned at any angle while under test, so that adjustments can be made without removing the generator from the test unit.

The test stand has been designed under practical shop experience it is claimed to meet a demand for an inexpensive, universal drive for all makes of generators and a brake test for starters combined. The adaption of the machine to the Ford liberty generator has been made especially easy.

Manufactured by the Reliance Battery Products Company, 2280 South Eighth Street, Council Bluffs, Ia.

Tel-Auto-Spark is an automobile instrument, about the size of a speedometer, that is said to locate trouble in the motor through a means of deduction, elimination and wireless resistance in a simple manner. The readings are easily understood it is claimed and all one needs to know about the instrument is the way it acts when there is no trouble in the motor; when different signals occur it is only necessary to look down the corners of the pages in an instruction book until the signal in the book agrees with the one on

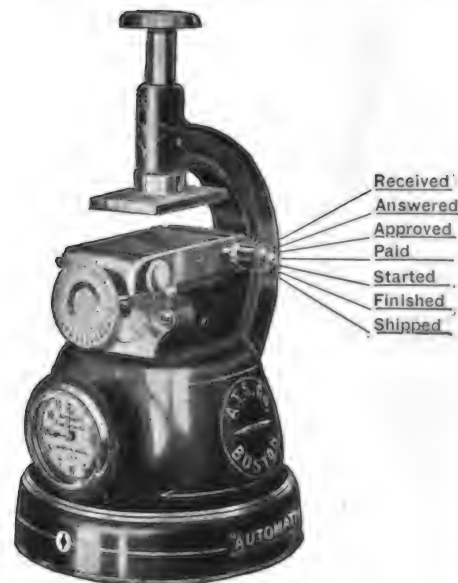


the instrument. Opposite the signal picture in the book will be found a picture of the motor with an arrow pointing out the source of trouble.

It also is claimed the device locates troubles in such a simple manner that it makes it a pleasure to keep up minor repairs. This assures a smooth running motor and enables anyone to keep the motor in perfect harmony and running tune under all conditions.

Manufactured by the Tel-Auto Spark Company, Tel-Auto Spark Building, Locust Street and Lindell Cut-Off, St. Louis, Mo.

Automatic Time Stamp is an appliance which adequately fills the needs of the modern garage and repair shop, it is said. It separates the profitable orders from the unprofitable ones and also indicates the relative competency of employees. For this purpose it may be equipped with



smaller unlettered hour and minute, or tenth and quarter hour dial dies, for starting and finishing indications of a job.

It also enables the time and date to be registered with far less effort than could be done in the ordinary way of looking at a watch or clock and then tabulating the data gathered. It is said to be very valuable in any position where an accurate time system is desired.

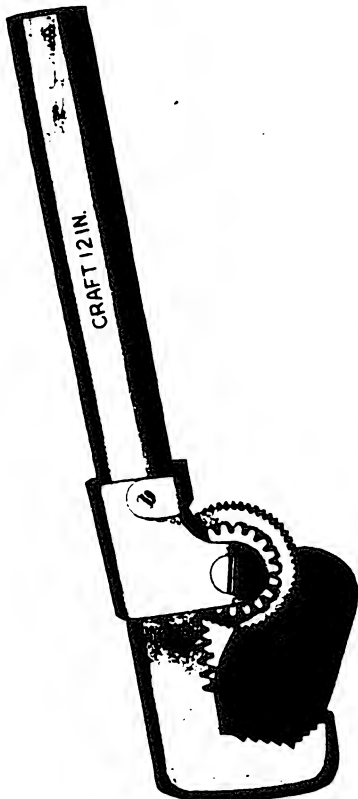
It can also be used to great advantage in dispensing with all arguments or questions as to just when a letter, telegram or order was received, for the exact minute is marked by passing it beneath the stamp of this automatic register. Simplicity is a feature of the mechanism of which this recorder is composed. This makes it extremely durable it is claimed and practically eliminates the danger of disarrangement.

The clock is heavily jewelled throughout and was especially designed for this particular purpose by the Seth Thomas Clock Company. It is said to be a very reliable time keeper and is connected with the time printing mechanism in such a way that it can be neither injured nor its correctness impaired by the jars of stamping, for the force of the blow is taken by the casing of the machine and not the clock.

Manufactured by the Automatic Time Stamp Company, 160 Congress Street, Boston, Mass.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

Craft Self-Adjusting Pipe Wrench is a quick acting one-hand tool that grips instantly and holds securely. The greater the force exerted on the wrench the tighter the grip becomes on the work. Immediate release is obtained by reversing the pressure. The spring in the handle holds the jaws ready to take another bite without readjustment. The wrench has a



three-point contact of the jaws on the work which, it is stated, gives a torsional grip that will not crush the work.

In use the head of the wrench is dropped over work, and the spring in the handle slides movable jaw into place against pipe. Push wrench handle and jaws grip—the harder the push the greater the grip it is claimed. By pulling the handle the disc holding movable jaw is at once released. In other words, the wrench follows the pipe around in contact with it and releases when lifted, but is ready to grip instantly when handle is again pushed down.

The Craft Wrench is case hardened pressed steel, light and strong. The disc is a heat treated drop forging.

Manufactured by Coleman Railway Supply Company, 30 Church Street, New York City.

Hell Hand Hoist is designed to handle loads up to three or four tons. It can be mounted on any make or model of light duty truck, and meets the demand of users of motor trucks for a simple, powerful and dependable hand hoist reasonably priced, it is stated.

The mechanism of the hoist is very simple. The cable is one continuous piece secured to a drum. When the body is being raised the cable is wound on this drum in a continuous scroll, which eliminates any pinching and wearing of the cable. The drum itself is mounted on a large diameter spur gear. This spur gear is driven by a pinion and a pair of bevel gears. The working parts are encased to keep out dirt.

The gears are so arranged that approximately 2½ tons lifting effort is secured with (30) pounds pressure applied to the crank. The crank is held from turning back by a ratchet pawl. This pawl can be used to hold the body at any desired elevation.

Lowering the body is effected by raising the ratchet pawl. The descent of the body can be controlled by a thermoid faced brake disc, which is operated by a handle. The brake handle is within easy reach of the operator.

The hoist is mounted on adjustable base brackets which can be spaced to fit the frame width of any truck. These brackets occupy 7½ inches of space. A heavy coil spring is placed at one end of the bracket; the other end is pivoted so that as the

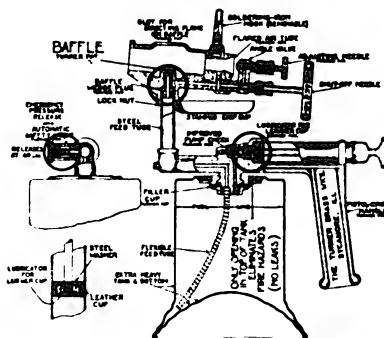


body is raised the springs will be compressed, allowing the hoist to incline toward the body, thus giving a greater dumping angle as well as making it easier for the operator. These springs, together with one way pivot hold the hoist so that it cannot slap against the cab or body or vibrate when the truck is moving.

Manufactured by the Hell Company, Milwaukee, Wis.

Turner Master Line Blow Torch is the result of many years experimentation on blow torches by a well known and long established manufacturer. This new tool is said to have every improvement known that will make a blow torch an absolutely safe device, such as safety valve, air release and improved pump check. It will burn either gasoline or kerosene without a change being made in any of the parts, and is capable of developing a great amount of heat.

There is only one opening in the tank of the Turner blow torch, it being in top



SECTIONAL VIEW—THE MASTER LINE—EVERYTHING NEW

where there is no fuel. This tends to prevent fire, explosions and damage to property. Blow torches are said to operate most efficiently at 18 to 20 pounds pressure. The safety valve is set to operate at 40 pounds pressure, making it impos-

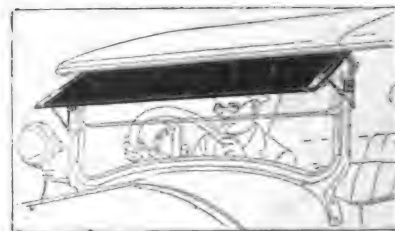
sible to get too much pressure and burst the tank.

The burner is equipped with a baffle on which the flame is constantly impinged. This is said to insure perfect vaporization of the present day kerosene or gasoline. The flared tube in front of the fuel jet automatically syphons the correct proportion of air, it is said, regardless of the size of the flame. The adjusting needle is pointed like that on a carburetor needle valve and is separate from the shut-off needle valve, making it well adapted to fine adjustment. A small hand wheel is used on the adjusting needle which prevents too much leverage being applied to the orifice.

The Turner Blow Torch is equipped with a special patented Turner air pump, which is constructed on the parachute principle. There is plenty of space for the air to pass the plunger on the up-stroke it is stated, while on the down stroke the air inflator spreads the leather cup and forces a full cylinder of air into the tank.

Manufactured by the Turner Brass Works, Sycamore, Ill.

Dad Windshield Protector is a recently developed windshield protector which is said to solve one motoring problem by making it possible to see day or night, in rain or shine. Two devices attach Dad's Windshield Protector to the glass windshield posts of any open car, or four brass plates screws to any closed car. Being "custom made" the protector can be constructed any length desired to correctly fit different makes of cars. Properly applied a windshield protector should extend the exact distance between the glass windshield posts it is said.



After careful, practical tests by the manufacturer of this appliance it was determined that 12 inches is the correct width for an effective protector for all purposes, and ¾ inches thick to maintain the necessary rigidity.

The top of these windshield protectors are covered with an extremely heavy, double texture black, automobile topping material, made extra strong for this product. The underneath side is covered with a beautiful green topping material, said to easily last as long as the car. This covering fits snugly, is plain and smooth, free from unsightly wrinkles and is tightened instantly any time by turning the four slotted studs or tightening screws.

Dad's Windshield Protector is adjustable in every way, it is stated, being instantly raised or lowered by a touch of the fingers, and, from the driver's seat, to fit your height, your eyes, or everchanging conditions of driving. Attractively designed brass telescoping, adjustable supporting brackets and housing ends that automatically adjust themselves to inclose and protect the ends of the covering material, add style and finish. All metal parts are beautifully black enameled, nickel plated and highly polished. There are no rivets or buckles to rust or fall off and no creases or cracks are apt to occur from contact of the metal with the material. The manufacturer also states looseness, flapping, bending, sagging or "cupping up" will not occur in the strongest wind storms, or when driving at great speed.

Manufactured by Dad Factories, Department A, Indianapolis, Ind.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

Minard "Ol-in-Oil" is said to possess all the requirements necessary to restore the original finish and luster to the surface of the vehicle without in any way causing detrimental effects to be observed on the original paint work.

It is stated that the results obtained by the use of this liquid are really remarkable, as it affords the refined luster sought by all polish manufacturers and yet, after being polished, the car is no more susceptible to road dust than if the polish had not been applied.

The polish is readily applied by the car owner and if done as the company directs it is said the results cannot fail to im-



press and gratify the user. The bottle of "Ol-in-Oil" should be well shaken to mix the ingredients thoroughly. Then two pieces of clean cheese cloth should be procured, one piece should be thoroughly saturated with the liquid "Ol-in-Oil" and a small space of the car body wiped over with it. Then the other piece of cheese cloth should be used to wipe the same space dry. This procedure should be repeated until the entire body of the car has been thoroughly polished, always using the dry cloth to wipe off the liquid before it has time to dry on the car.

Manufactured by Minard Company, Framingham, Mass.

A. C. Speedometer and Drive for Ford cars is an attractive instrument said to indicate very accurately over rough roads.

The A C Speedometer is driven from the right front wheel it is asserted and the drive assembly can be attached without



drilling holes in hub flange or spokes. Three of the regular flange bolts hold the driving gear, this being connected to the flexible shaft by a coupling which eliminates the need for a swivel. The gear



pinion is of an improved fibrous material that insures noiseless, efficient and continuous operation.

The A. C. hole cutter, an ingenious device for installing the A C Speedometer in metal or wood instrument boards, is a companion product to this new instrument.

The speedometer is a fully jeweled and self-lubricated magnetic instrument with black face and white figures, having a rim of solid brass nickeled.

The manufacturers of this appliance believe it will be popular because of the legislation in many communities which requires that all cars be speedometer equipped.

Manufactured by A. C. Spark Plug Company, Flint, Mich.

Allen Connecting Rod Aligning and Straightening Fixture is a precision tool for the repair shop and service station.



Most all repair men realize the importance of correctly aligned connecting rods. The expense, trouble and ill will of the customer resulting from a single job of connecting rods out of align would easily pay for this tool it is said.

The illustration shows the rod assembled with wrist pin and aligning bar in testing position. Both twist and parallelism of holes are shown in one setting. The aligning bar has an expansion feature which makes it quick acting. In using the bar first insert a bushing of the proper size into the connecting rod bearing with slot (or opening) on the cap side of the bearing, the aligning bar is then inserted into the bushing with the key coming up through the slot of bushing and binding against the cap or rod by tapping lightly on the large end of the key.

The fixture is accurately finished throughout its entire construction in order that all work tested with it may be absolutely correct. The patented aligning bar and the upright studs are of a good grade steel, hardened and ground.

Manufactured by Allen Wrench and Tool Company, Providence, R. I.

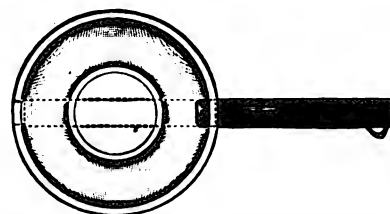
Ramco Cotter Pins are said to materially aid the mechanic in removing cotter pins from the most awkward positions.



with ease and small amount of effort. It is not even necessary to straighten the pin it is said, as the leverage is applied in such a manner that the pin is easily withdrawn from any angle.

These pliers are made of drop forged steel, properly tempered to withstand any usage to which they may be subjected. They are also subjected to a process which makes the metal rust proof and non-corroding it is stated.

Sta-Tite Crankshaft Starting Pin is designed to take the place of the No. 3040 crankshaft starting pin on Ford cars. This pin is easily installed in a few min-



utes and is said to give entire satisfaction.

Kill-nock Bearing Bolts are said to stop all knocks in the connecting rod bearings, without the necessity of shims,



tinkering or adjusting. They automatically take up the wear as it develops through the wearing of the babbitt metal. A spool nut holds the two bearing halves at the proper tension, while a blue steel spring gently turns the spool nut upward only as fast as play develops, through the wearing of the babbitt metal. A castellated washer holds the spring in place.

These bolts can be used with all types of connecting rod bearings except the few that have loose, set-in babbitt bushings. The bolts are guaranteed by the company to stop connecting rod bearing knocks.

Kill-nock Piston Guide is said to save considerable time when installing the piston and rings of an engine. This tool guides the piston and also compresses the rings so that the installation is made in an agreeable and easy manner. A set of



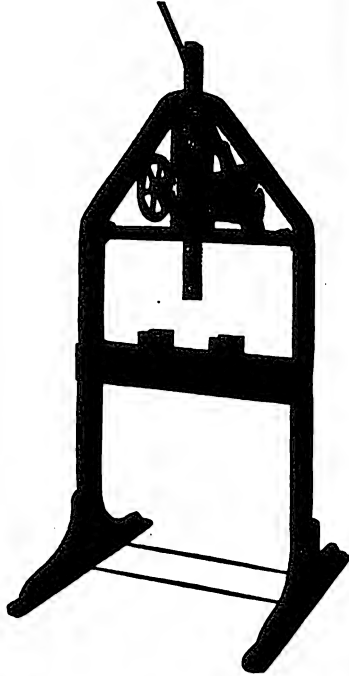
three of these useful devices are said to fit all sizes of pistons up to five inches in diameter. The piston with the rings in place is slipped through the piston guide, then this entire assembly is moved around until it enters the bore of the cylinder.

The guide is made of a good grade spring steel and electrically welded, which makes it very substantial and well able to withstand severe usage if necessary. Price for the set of three \$4.50, or \$1.50 each.

Manufactured by Ramsey Accessories Manufacturing Company, 1500 North Broadway, St. Louis, Mo.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

Evansville Garage Type Arbor Press will remove a stubborn pressed on gear or roller bearing race with only a slight amount of exertion it is said. The exceptional leverage of this press is obtained by designing the working lever to work over a compound, thus producing a really remarkable amount of power with mini-



mum expenditure of effort.

There is no need for the operator stepping away from the work while exerting the pressure, as the press can be operated with one hand, while the other one may be used to steady the work. The ram or plunger is of the rapid action type, moving quickly up or down to the desired position. When it is desired to raise the ram it is easily done by pulling down on the hand wheel, which is geared in such a way that the downward motion of the wheel causes an upward motion of the ram. The desirability of this feature is sure to be appreciated by anyone operating the press without any additional help.

In order to increase the reliability and strength of this product the manufacturer has equipped the press with a five-tooth pawl operating on a 48-tooth ratchet, which greatly reduces the possibility of stripping the teeth and also allows the use of short strokes while it is being operated. Two substantial rods are extended from one foot of the press to the other, tending to make the press absolutely spring proof, it is stated.

Manufactured by Evansville Arbor Press Company, Evansville, Ind.

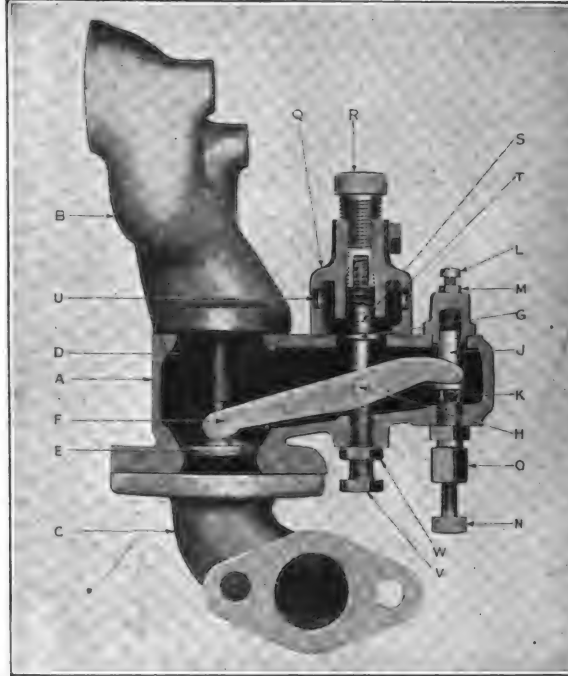
Aerometer is a cleverly designed, nicely finished device, which is said to increase the mileage, power, economy, speed and smooth running qualities of the Ford motor. The action of the device is automatically controlled by the vacuum maintained in the engine intake manifold. When the vacuum is great the auxiliary air valve is held tightly against its seat, but as the speed of the engine increases the vacuum in the manifold is reduced, causing the auxiliary air valve to open and admit the necessary oxygen to make the combustion complete and instantaneous.

Features attributed to this device are its ability to reduce fuel consumption, lubricating oil consumption, carbonization of the engine cylinders and pistons and, it is also said, to prevent the back fire of the motor from reaching the carburetor.

All working parts of the Aerometer are made of high brass and the springs are wound from hard phosphor bronze, making them rust proof and practically non-

breakable. All parts are machined to close limits, eliminating the necessity of any fitting when replacements are being made.

It is said the installation of the device is extremely simple and that any one who can take off or install a Ford carburetor can install the Aerometer in a few min-



ut. s. The device is absolutely guaranteed to give satisfaction. In addition to this the manufacturer makes more specific claims. It is guaranteed to increase the mileage of the vehicle at least 20 per cent. and to improve the running of the motor generally. A guarantee of one year is allowed on all material and workmanship.

The price of the appliance, including a special manifold and elbow, assembled and ready to put on in place of the regular Ford manifold is \$10. Nothing additional is needed and no changes are necessary.

Manufactured by the American Automotive Appliance Corporation, 2553 Hillier Avenue, Detroit, Mich.

Dorrence Spark Plug Wrench is said to embody many features which are decidedly advantageous to either the garage man or the car owner. Many autoists who have been unfortunate enough to break the porcelain of a spark plug just being removed realize how easily this damage is accomplished and how disastrous may be the results if a spare plug is not in the tool kit. It is claimed this wrench absolutely protects the plug when it is being screwed in or out of the engine cylinders.



It will fit any plug and is said to be self-adjusting. This advantage is attained for the wrench by making it split through the center with the fulcrum at the points where the screws are inserted. As pres-

sure is brought to bear on the wrench handle it causes the opposite end to tightly grip the plug. This makes a powerful grip and one which it is stated will not slip, break a porcelain or injure the plug in any way.

The wrench is manufactured of a good grade of malleable iron and heavily nickel plated, which aids greatly in protecting the wrench from corrosive action. It is sold for 80 cents by the maker or dealer.

Manufactured by Charles J. Dorrence, Chicago, Ill.

Dorrence Nut Spinner is extremely simple yet it is said to fill the requirements for a proper wrench in handling the base nuts on inner tubes. It fits either the small or the large base nuts and makes their removal both quick and certain.

The tool is fashioned like the hand wheel of a valve and after being placed over the nut it may be spun off or on as desired. It is constructed of a special high grade steel which is well able to stand the most strenuous use it is said. The weight of the device is only approximately 1 1/4 pounds.

The Spinner is four inches in diameter



which allows the user to exert plenty of leverage by grasping the wheel in the hand. The price is 80 cents each.

Manufactured by Charles J. Dorrence, Chicago, Ill.

Dorrence Valve Lifter is constructed with four jaws having reversible openings of different widths to meet the requirements of the various size valve spring caps and at the same time pass all pin and horse shoe keys now in use. This valve lifter has a range of lift to adequately handle any job encountered it is stated. It has a simple locking device which is at the same time decidedly effective. This device holds the jaws firmly apart at any point of the lift, without the aid of ratchets, springs or screws.

The Dorrence Valve Lifter will lift all sizes of gasoline engine valves states the manufacturer, quickly and easily. Although the leverage is ample to handle all size valves it is stated, still it is not great enough to bend the valve stem. The lifter has been designed with five fulcrum bearing points, which permits the moving of the upper or lower jaws forward or backward as occasion requires. The jaws may also be reversed if necessary, making many handy and necessary arrange-



ments possible.

The tendency toward side slipping is actually prevented by the roughened jaws and the design of the tool it is claimed, while freedom from chains, levers, screws or other assistance make it very desirable to the average motorist.

Manufactured by Charles J. Dorrence, Chicago, Ill.

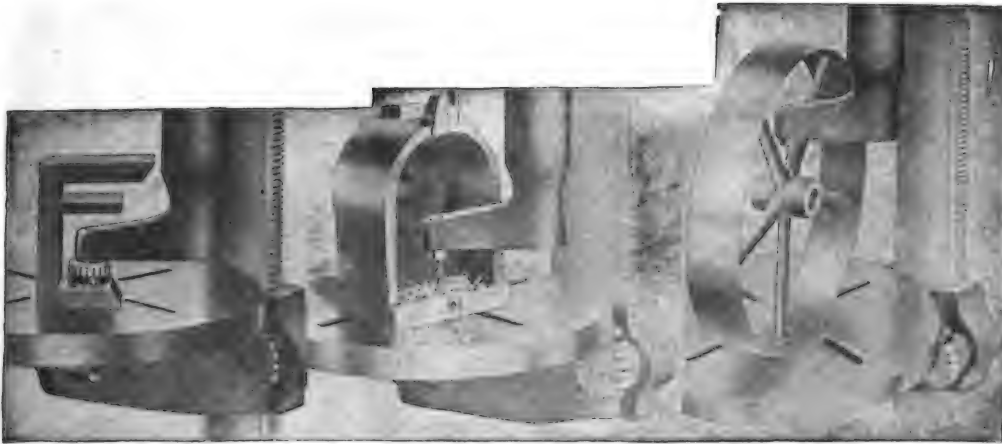
(When Writing to Advertisers, Please Mention the Automobile Journal.)

Harris Offset Drilling Attachment, as its name implies, is an attachment for the drill press which makes it possible to drill, face and counterbore holes and bosses in out of the way places, that can-

not be reached by the usual methods. The drive is strong and powerful, being driven by a square shaft instead of the use of a key.

The construction is rigid and strong

with a ball thrust bearing. The driving gears in the attachment are made of carefully heat treated vanadium steel gears, which are tested to a high degree for strength. The workmanship is of the



not be reached by the usual methods. It is valuable for use in standard lines of manufacture, such as automobile, munition, railroad work, machine tool work and in jobbing or contract shops in general. This tool is made in eight sizes it is said, to fit every standard make and size of drill press or similar machines.

The attachment is so arranged that it may be swiveled around the center of the drill press spindle in any position found

and the attachment will stand up to the work in a very efficient manner it is stated. The tool holder for holding drill, counterbore or mill, has a positive drive and means for holding the tool centrally, so that they run true, and the change from one tool to another can be readily made without disturbing the set up of the attachment in the drill press.

The drill spindle runs in a hardened and ground tool steel sleeve and is provided



highest grade and the tool runs smoothly without chatter it is stated.

Manufactured by the Harris Engineering Company, Bridgeport, Conn.

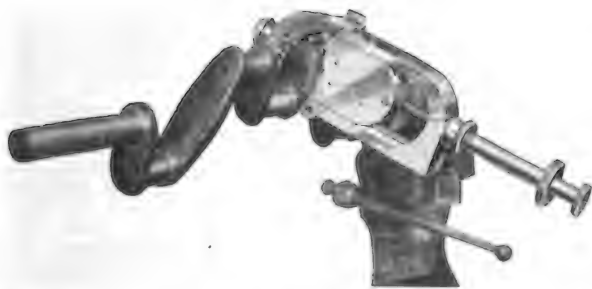
Sutter Crank Shaft Tool is said to accurately refinish crank pins without the aid of any special off-center jigs or fixtures. This tool will true any shaft from 1 1/4 inches to three inches, it is stated. It has three different width blades, which enables the operator to true any width of pin. The tool will work either on a lathe, or by hand if the operator desires.

The Sutter Crank Shaft Tool is built substantially and simple. It needs no wrenches, screw drivers or other tool to

adjustable racks can be instantaneously turned, raised or lowered according to the direction of the wind and the height of the campfire flames. There are no set screws or pins to adjust on the racks. They stay put, in any position, and have

plicity of construction. It is one of the latest improved labor saving devices on the market and should pay for itself in a short time.

This same company make a combination aligning reamer said to give perfect alignment on all Ford bearings. To operate,



first place the reamer in the main bearings, after which pass it endwise; draw connecting rods on the flutings of the reamer and ream one at a time until the four connecting rods have been properly fitted. This gives a two in one reamer, which will ream all seven of the Ford bearings.

All tools are guaranteed by the manufacturer against defects in material and workmanship. Broken or defective tools



must be returned for inspection, carriage prepaid.

Manufactured by Lewis Tool Company, 612 Fifth Avenue, South, Minneapolis, Minn.

adjust it. Its parts are universally driven throughout, making it simple to operate and do perfect work. The makers state it is built for accuracy and will true a pin by removing only the metal that needs to come off. It is meeting with the approval of the best mechanics in the country, it is said. The cost of this tool is \$75 f. o. b. St. Louis.

Manufactured by Fred Shaw Manufacturing Company, 2621-27 North 22nd Street, St. Louis, Mo.

Campfire Grub Stake is a neat, handy appliance for the hunter, camper, tourist or the picknicker. It is light, strong, compact and portable. It weighs only seven pounds and is completely and snugly packed in a strong fiber container 1 1/2 inches high, 20 inches long and nine inches wide. It can be carried in a hiker's pack or under the auto seat and is guaranteed against breakage and mechanical defects.

The grub stake is manufactured in two parts, it can be set up or knocked down, it is claimed in one minute, and its ad-

simply to be lifted slightly to be moved. The retail price is \$3.50.

Manufactured by Campfire Manufacturing Company, 1035-36 Boatmen's Bank Building, St. Louis, Mo.

Lewis Connecting Rod Reaming and Double Aligning Fixture is so constructed that it will ream and align bearings of any size, eliminating all guess work and practically all hand scraping. To operate clamp the wrist pin to "V" in arm, which is adjustable from four to 14 inches; draw bearing down on reamer until it takes hold, then turn reamer by handle and repeat operation until bearing is up tight. Upon removing reamer the bearing will be found in perfect condition it is stated.

The fixture can be used on old work as well as new and requires no skilled mechanic to operate. It can also be used for testing the alignment of the connecting rods with the piston, on or off.

It is said this device has wonderful merit and enables the operator to do better and faster work on account of its sim-

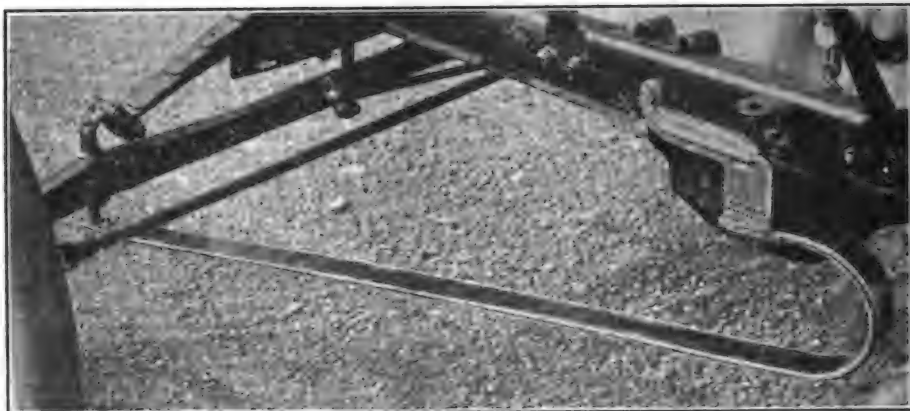
(When Writing to Advertisers, Please Mention the Automobile Journal.)

The Perfect Strut Rod is a device said to be meeting with decided approval by all Ford users who have placed it on their cars. It is claimed it eliminates the possibility of accident caused by the slender wishbone construction used to reinforce the Ford front axle. It is also claimed these strut rods remove the possibility of broken crank cases.

The Ford is originally built with two round rods extending from the lower side of the spring perches to a point just forward of the engine flywheel casing. It is said the entire strain which is encountered by the front axle is in this way transmit-

shift, but instead it appears to be an integral part of the machine's design. The manner in which it is applied will recommend it to many owners who refuse to drill or install devices that are not made to conform to the original design of the Ford. It is an absolute fact that removing metal from a part of any machine weakens it materially. For this reason the Perfect Strut Rod is made to fit on the Ford without drilling or machining. All that is necessary is to install the longer bolts in the holes already made in the Ford chassis.

The application of these devices has



ted to the engine crankcase and many crank cases have been broken when the axle was subjected to unusually rough roads.

The application of the Perfect Strut Rod is said to prevent even the possibility of any such serious derangement which makes it a decidedly welcomed device to all the users of this make of car. The Strut rod is designed to be attached by the aid of brackets to the frame of the Ford. It is attached to the front axle and then extended back to the side channel frame of the car, where it is securely clamped and bolted, without the necessity of any machining whatever.

This device is not made like a make-

Hyrate Hot Knife may be used as a purely portable tool in the garage or on the road by connecting it temporarily to any three-cell battery by the patented connector clips furnished. If preferred the knife may be installed permanently at some location on the shop bench. With the second form of installation a three-cell storage battery should be provided. This battery should be arranged to be charged from the line or placed in series with one of the regular charging lines so



that it will be continually supplied with the current.

After connecting the knife to the battery the blade will be at the proper temperature after a few seconds, and can be used as a hot compound knife, as it is being continually heated by the current flowing through the blade. The heat generated in the blade is distributed to keep the heat concentrated in the tip of the blade. The method of using the knife is largely determined by the method of sealing used. One method is to insert the knife between the jar and cover, keeping

been made in many of the large city motor departments and municipal garages to the entire satisfaction of the proprietors, it is stated. These men all have expressed their entire satisfaction with the Strut rod and claim it prevents "shimmying," makes steering very much easier, aside from the main accomplishment, which is removing strains from the engine crank case.

The Strut rods are shipped in sets of two, one right and one left, with all necessary brackets, nuts, bolts and washers, ready for installation at a cost to the consumer of \$12.50.

Distributed by the Strut Rod Sales Company, No. 7 E. 42nd Street, New York City.

as near to the jar as possible. Force the knife the length of the side. Then holding the blade at an angle make another cut so as to complete a cut each side of the compound. The compound may be lifted out as the second cut progresses. In this way a maximum amount of compound may be removed with a minimum amount of melting of compound.

If the battery is so constructed that the vent barrels or posts are in the way when the knife is held at an angle, make only one cut vertically, thus separating the compound from the jar. The compound can be readily removed from the cover after the cover is out of the cell. The knife is for a six-volt battery and should never be placed across the main terminals of a 12-volt battery, nor directly connected to the lighting circuit.

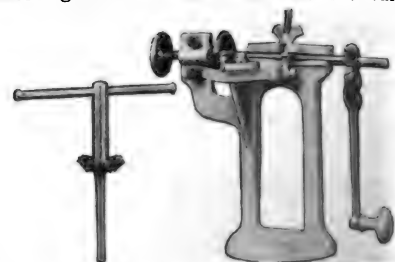
Manufactured by Service Station Supply Company, Detroit, Mich.

Whitney Valve Refacing Lathe operates with complete accuracy, refacing all valves except those of extreme tungsten hardness; while the Whitney Combination Valve Reseating and Valve Port Resurfacer insures a like seat in the cylinder block, thus the work is completed with slight valve grinding, which is necessary to polish the seats.

The lathe is designed to be mounted on the bench or held in a vise and is adjustable to take any valve $\frac{1}{4}$ to $\frac{1}{2}$ inch stem diameter and valve head up to $2\frac{3}{4}$ inches in diameter, therefore its range of work is practically unlimited, pertaining to its use in the automotive field.

By lifting a gate in the top of the lathe the valve may be laid in a V chan-

nel which acts as a guide for the valve stem, while a tension screw holding the gate against the stem allows the valve



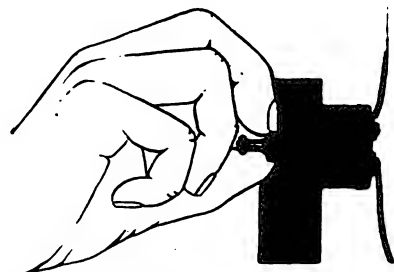
stem to be rotated freely, yet it prevents chatter and vibration or any springing or distortion of the valve while being cut. The centering adjustment or feed control is mounted on a sliding block, traveling on a guide said to insure accurate centers and even tension of the valve against the cutter. It is said the refacing of the valve is in perfect alignment with the stem, therefore a very meritorious feature of recognized importance is embodied in this tool.

The manufacturer states the lathe is substantially built, combines no complications or delicate parts and is universally adjustable to all work within reasonable bounds.

Manufactured by R. S. Whitney Manufacturing Company, 74 Nichols Street, Lewiston, Me.

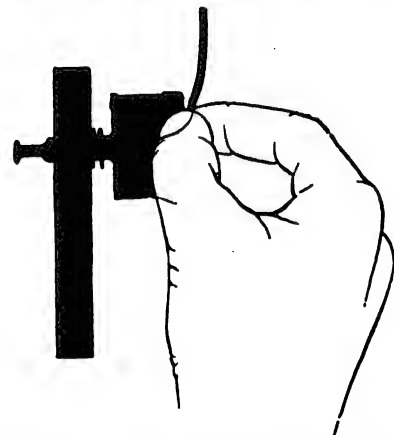
C H Utility Automobile Switch is a dash control for automobile lights, particularly courtesy and trouble lamps.

To install it only one small hole is required, $\frac{1}{8}$ -inch diameter. Through this the long threaded stem is pushed, after which the locking nut is screwed in place.



It is not necessary to drill or punch several holes and no plate is required. Adjustment of lock washers both sides of the surface on which the switch is installed, permits of securing the switch to different thicknesses of metal or wood. The installation is easy to make it is said and takes but a few minutes.

The mechanism of the switch is of the quick make-and-break type, which is not



affected by vibration of car it is stated. The operation is effected by means of a nickel plated push and pull button.

Manufactured by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

Misener Rotary Hack Saw is a tool for cutting round holes in metal, wood and all other kinds of material. It is light, portable and so inexpensive, it is claimed,



one should be in every tool kit. It is a well known fact that the cutting of large round holes in metals or other materials that have already been assembled is a

very difficult job. The rotary hack saw will save all the drilling, filing and reaming that is ordinarily done on work of this kind. When the Misener has cut

in a very short time.

Garages and service stations will find the rotary hack saw a great labor and money saver when used for cutting holes for the installation of speedometers and other instruments. By grinding worn blades to a knife edge a good gasket cutter is available. The No. 1 Misener Ro-



tary Hack Saw completely equipped with bit brace shank without blades costs \$12 net. Machine Taper Shank, \$1.90 net. Round Straight Shank, \$1.75 net.

Distributed by Robert M. Irving, Syracuse, N. Y.

Stewart-Warner Carburetor equipment for Ford cars and trucks includes a complete carbureting system of advanced design it is claimed. The mixture proportions are controlled and varied automatically and inherently in the carburetor to most nearly fit the needs of the engine, both with respect to economy of operation and the development of high power. But the full advantages of such control of the mixture proportions cannot be enjoyed unless the fuel supplied by the carburetor is vaporized before it enters the cylinders. This very important step in the preparation of the mixture is said to be taken care of by making the vaporizing chamber a part of the manifold assembly. By this means it is said the fuel is completely vaporized and then mixed with the air in the intake manifold.

Many advantages are claimed for this device, the crank case oil is not diluted and thinned out with fuel and what carbon deposit is formed in the cylinders is only that due to road dust drawn in with the air and to excess lubricating oil in the combustion spaces. Spark plugs do not foul, and hence do not require to be

fered with, but it also subjects the nozzle outlet to the greatest suction or pressure drop that exists in the intake. To make best use of this great suction in spraying the fuel the nozzle is provided with a central tube, the entrance of which is free to the atmosphere. Air is thus drawn at high velocities through the air tube of the nozzle, and shortly before it leaves this passage it passes through a constriction in the tube which further increases its velocity. Just beyond this constriction the high velocity column of air picks up the fuel that is drawn out of the float chamber by the normal suction in the throat tube where the nozzle outlet stands.

Manufactured by Stewart-Warner Speedometer Corporation, Chicago, Ill.

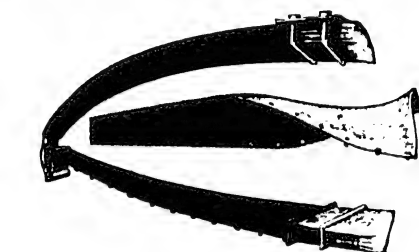
Woodworth Adjustable Lubricating Spring Covers are said to be giving excellent service to many users.

These lace-on covers are made exactly the right size for the springs, making them very easy to put on. The covers have a felt lining which is saturated with oil when they are put on, and oil cups are provided to replenish the oil. The covers are made in two grades, an imitation leather consisting of a strong cotton backing with a genuine nitro cellulose coating which is unaffected by the action



cleaned. With a vaporous charge there are no irregularities of distribution, all the cylinders receive the same quality of mixture. This in itself wonderfully smooths out and sweetens the running of the engine since it makes successive impulses equal and thereby reduces engine vibration, it is claimed.

The carburetor is a simple metering device, designed to have the characteristics discussed in the foregoing, and arranged to operate effectively with the vaporizer. To secure this the throttle valve is located in the air intake of the carburetor, instead of in the mixture outlet, as is usual. Not only does this get the throttle out of the way of the fuel spray from the nozzle, so that the spray is not inter-



of oil or water. They are also made of genuine grain leather of very rich appearance. The covers are held on the springs by lacing on the under side with a shoe hook and lace fastening.

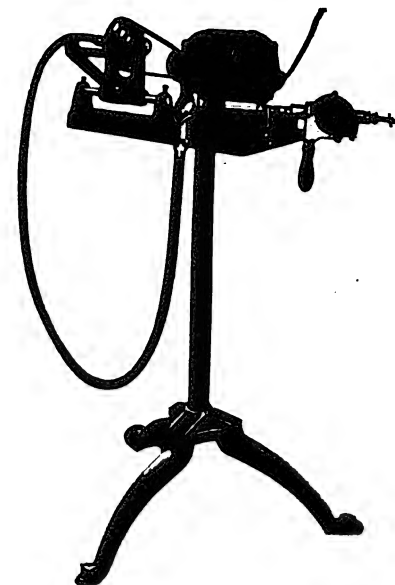
For cars with semi-elliptic springs the price of the covers is \$7.50 per set in imitation leather, or \$16 for genuine leather of very high quality. For Ford cars the price is \$2.50 per set for imitation leather or \$5 for grain leather. These covers are especially desirable for the motorist who wants freedom from spring squeaks.

Manufactured by the Woodworth Specialties Company, Binghamton, N. Y.

Sioux Flexible Shaft and Attachments make a very handy appliance for any size shop, it is said.

When used for valve grinding it has many advantages. The three-speed pulley makes it possible to adapt the correct speed to the size of the valve. Thus for larger valves you can use the low speed in order to keep the grinding compound from caking and flying off, while the higher speeds can be used for smaller valves.

The control makes it possible to stop



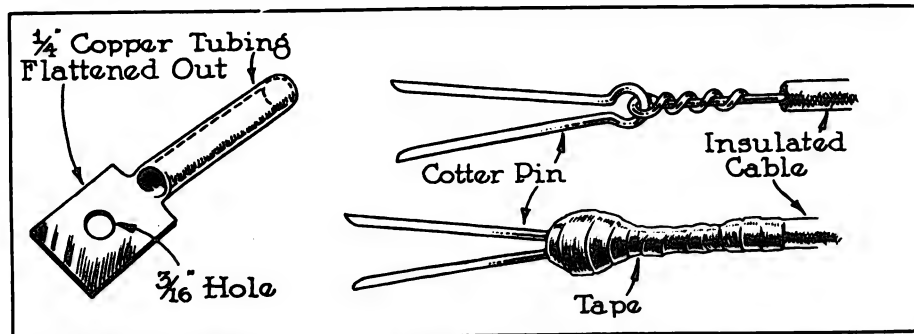
the grinder instantly, it is said, without shutting off the power. This feature enables the operator to lay down the grinder when he desires to clean the valve, without having to reach up and shut off the power.

The operator can take the emery wheel to the work and get into almost any place necessary. This device is especially handy in welding work for smoothing out the weld.

The tool can be driven directly by a motor, a lathe, drill press, line shaft, emery wheel stand or any other power that will drive the shaft at a speed of 1000 to 1725 revolutions per minute.

Manufactured by Albertson & Company, Incorporated, Sioux City, Iowa.

(When Writing to Advertisers, Please Mention the Automobile Journal.)

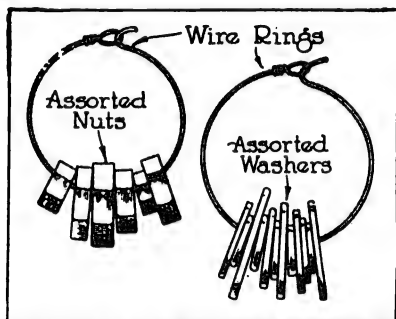


A Terminal Which Will Give Very Satisfactory Service Can Be Made from a Small Piece of Copper Tube and a Cotter Pin.

(Continued from Page 15.)

Should Carefully Watch Tires.

The driver of the car can also exercise a great saving of tires if he will but heed the advice so often given by tire manufacturers, but, so seldom practiced in actual driving. When the writer first entered the automobile industry (and it was at that time in its elementary stages) he was cautioned about driving in the car tracks, and I really doubt if there exists a motorist who has not been cautioned in the same way, but still at some time or other does this very thing in spite of the oft repeated warning.



Nuts and Washers Should Be Strung on a Small Wire and Ends Looped Together.

There is no reasonable excuse for the owner of a car driving it along the street railway tracks unless the road itself is in such poor condition that more damage would be done to the tires by loose, sharp stones, or the mechanism by harsh bumps. The injurious effects of this driving results from the fact that the entire load of the machine is taken on a very small portion of each tread, ultimately causing a great deal of heat which in a short time forms a groove in the tire.

Another manner in which the tires are often severely damaged is by driving too close to the curbing on stopping at village stores or shops. This causes a fling action on the tread when the car is moved which must soon damage the side-walls beyond repair.

The chances are decidedly favorable that the owner of a present day automobile will not experience trouble, even having to change a tire for the entire trip, but the recitation of the emergencies that may be met with should prove interesting to the reader, and perhaps will be instructive as well.

Hints for the Tourist.

Sometimes when dismantling a unit of the car a screw or stud will break off

short making it difficult to remove. This may occur far from a repair shop. Generally there is not enough projecting metal to allow a good grip to be obtained with the pliers, but sometimes a slot can be cut in the metal in which a screw-driver may be inserted and the screw backed out in this manner.

If there is not enough to do this, a small hole should be drilled in the center of the broken stud and the tang of a file lightly tapped into the hole. Then, by placing a wrench on the file and turning it, the screw usually is removed. Another method may also be used if facilities are at hand. If the stud to be removed is right hand threaded and a small left hand tap is available, the center of the broken stud may be drilled out to the tap size and the hole threaded (with the left hand tap) which, on being screwed up tight, will back out the broken stud.

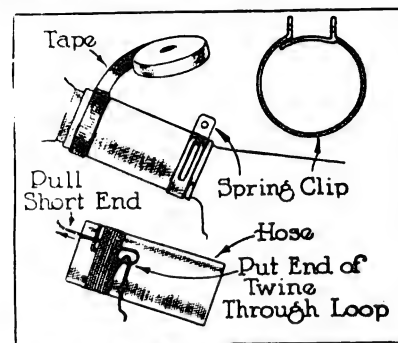
Emergency Hose Repair.

The writer at one time was on a Sunday trip to Buzzards Bay, and, while stopping for gas, noticed a water leak between the radiator and water hose connection. While the leak was not dangerous or of great extent, it was corrected before going on by a connection that the reader may be glad to know about.

The hose clip had been tightened until both ends were closed tight making it impossible to get more tension by tightening the binding screw. The clip was removed and 10 or 12 turns of insulating tape applied to the hose, then the clip was replaced and, when tightened

so that the water drip was stopped, there was still more room for adjustment. Another Good Repair.

Another means, which has been used with good results when the hose clip was found broken, was the substitution of a strong twine to bind the hose, such as is used in fishing. It is better than wire, and when wound on neatly and secured without a knot by underlaying the ends, it makes a real workmanship job. In applying the cord, take about five feet, double it like a hairpin approximately six inches from one end and lay it on the hose. Then take the first round turn about two inches from the bend and draw up tight, following with as many turns as may be required, always working toward the loop but keeping the turns close together. Then the long end should be passed through the bend or loop and the short end pulled to draw

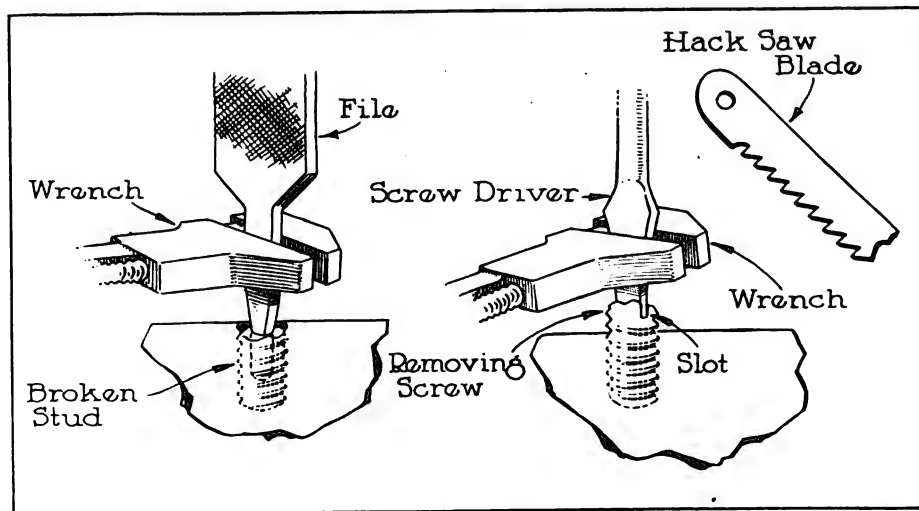


Two Methods Which Can Be Used in Stopping Water Leaks at Hose Connections.

the tight well under the turns. The ends may then be cut off and the job will last for a long time.

Ingenious Spark Plug Terminal.

At another time, the wire to a spark plug was found broken close to the terminal and a satisfactory connection made to replace it by flattening out one end of a piece of copper tube and drilling a hole through it to fit the screw on the spark plug. The wire was then securely fastened to a $\frac{1}{4}$ in. cotter pin and securely taped. The ends of the split pin were then spread open and inserted in the short piece of copper tube, and the tube fastened to the spark plug. This made a splendid terminal, giving excel-



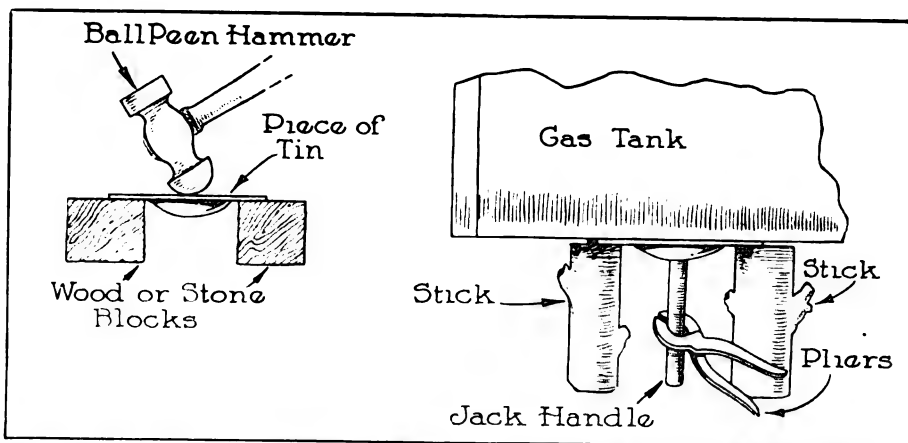
Left—Using the Tang of a File to Remove Broken Screw. Right—Screw Driver Being Used to Back-Out Broken Stud After Slot Has Been Sawed in Stud.

lent contact and security from shaking loose.

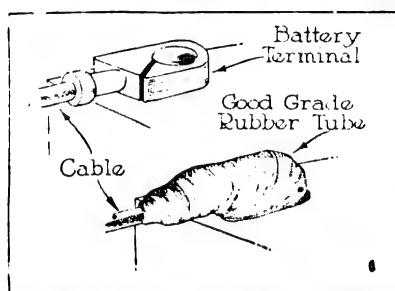
Fixing Punctured Gas Tank.

While touring through the hilly sections of New Hampshire, a party of motorists were slightly dismayed when their engine went dead. Upon examination, it was revealed that the gas tank had been punctured by a flying stone. This was a puzzling situation, but it was overcome in the following manner.

First, the tank was thoroughly aired out by using the tire pump to blow out any fumes which might be present. Second, the top of a baking-powder can was found in a dump near the side of the road. This was formed into a saucer shape by using the ball peen of a hammer. A fire was built on the side of the road over which the saucer shaped tin was held with a pair of pliers, to which a green stick that would not burn had been fastened. A small piece of solder,



Repairing a Punctured Gasoline Tank May Be Accomplished by Using a Piece of Tin, Blocks of Wood, the Jack Handle and a Pair of Pliers.



Covering Battery Terminals Aids in Protection from Corrosion or Short Circuits.

which fortunately was found in the tool-kit, was placed in the tin and melted. The point at which the puncture had occurred was thoroughly cleaned and some flux applied around the surface. The detachable handle of the car jack was then heated in the fire. When it had gotten red-hot, the saucer shaped tin was placed underneath covering the puncture, being held up in this position by the two pieces of wood. The heated bar was next placed against the patch and held in position for several minutes. This procedure caused the solder to melt again and adhere to the tank. After the entire patch had cooled, the two supporting rods were removed and the job proved to be thoroughly reliable.

Then the real work had to be done by one of the party who walked two miles (he swore it was 10) for a supply of the necessary gasoline.

Corroded Battery Terminals.

Very often motorists are troubled from short circuits at the battery terminals. This may be prevented and the terminals protected against corrosion if the wiring is removed from them, and a piece of rubber tubing slid over the cable insulation before the terminals are replaced. This rubber tubing should just fit the outside of the cable. The connections then should be remade and the rubber cable pulled down over the entire connection, thus protecting all the metal parts.

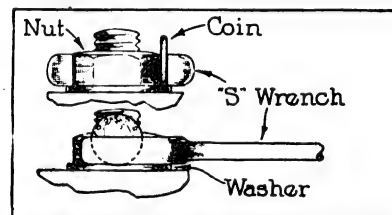
Making Loose Wrench Fit.

Very often, while on long trips, numerous nuts about the chassis need tightening in order to stop a slight rattle or squeak. If the nut happens to be in an inaccessible position, it will be found necessary to use an open end "S" wrench to accomplish the job. If it happens (and it often does) that no "S" wrench of the proper size is carried in the tool-kit, many motorists use the next size larger wrench, which barely catches on the corner of the nut. The result of such a procedure is a badly battered and rounded nut. Instead, use the next size larger wrench, but pack it up on one side with a nickel, a dime, or a

penny. This will cause the wrench to closely hold the nut in its jaws and will prevent damage to the flats on the nut.

Spark Plug a Substitute for Matches.

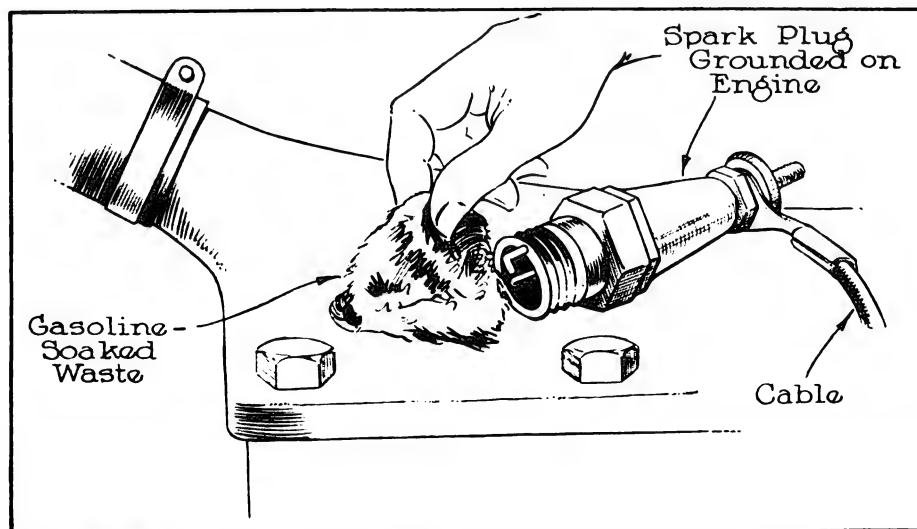
While on a fishing trip with a party of friends in the Maine woods, a rather interesting experiment was tried (through necessity) and good results obtained. We all started out from the camp one morning to fish a stream at a distance of about three miles from camp. Just as we were getting decidedly engrossed in the sport, it started to rain, and it came in veritable sheets.



A Solid Wrench Can Be Often Made a Fit for a Smaller Nut by Using a Coin.

The sport was too interesting to stop, however, even though we were soaked completely by the rain. When ready to start for camp once more with an exceptionally fine catch, one of the party asked if anyone had dry tobacco, stating that his was all wet. After an examination, it was found that only one person had tobacco that could possibly be smoked, so we all filled our pipes from his rubber pouch. An then—no one had a match! For a short while there was silence and gloom among all members. Then the following solution was found for our troubles: A spark plug was removed from the cylinder block of the motor car. A small piece of waste was saturated in gasoline from the carburetor. The plug was then grounded on the engine and the ignition switch turned on. The engine then was turned over and the piece of saturated waste held close to the spark gap of the plug. This ignited the waste and all enjoyed a smoke which tasted far better, because of the trouble experienced in obtaining it.

It is a good plan to use a stick in the above case, which will prevent the possibility of scorched fingers. The wet waste is readily wrapped around the end of the stick and this removes the fingers from any danger of contact with the sudden blaze.



Fire Is Easily Obtained by Removing a Spark Plug and Holding the Gasoline Soaked Waste Close to Its Gap While the Engine Is Turned Over.

(Continued from Page 9.)

gle heavy blanket lined with ordinary cotton or linen sheeting. They are not sewed up the side, but go together with snap buckles, and though I can easily imagine that they would prove wholly desirable for persons of ordinary stature, to tell the truth they were about one size too small for me, and I slept with the snaps unbuckled for the most part, using the upper half of the bag as a coverlet.

Other heavy blankets sewed up in what is apparently a sort of blue denim which gives them somewhat the appearance of a comforter are also taken along for use as extra covering. Four folding camp stools and a knock-down table complete the details of this part of the luggage, the whole making an easily set-up camp and one that is as easily taken down and packed away in the car, and in my humble opinion one would seek far to better this outfit.

Cooking is perhaps the most important part of camp life. Just because one is out to "rough it," is no reason why one should eat food from the can, half-burned bacon and coffee that appears to have been dipped from a convenient "puddle hole," as they call a mud puddle down Arkansas way.

It's quite as easy and lots more healthy to eat good food cooked in the right way.

Surely it adds to the delights of camping in no small measure, and to my way of thinking has about 50 per cent. the vote in determining whether one is having a good time or not.

It is quite evident that the relatives with whom I camp feel the same as I do about the matter and I believe that I can truthfully state that during the entire month I was with them last summer I ate better meals than would have fallen to my lot had I stayed at my regular bachelor quarters in Pittsburgh. My uncle, because he has a thorough knowledge of camping gained over a period of many years, scorns any cooking fire other than the regulation wood fire, although he is not above carrying a very small, compact alcohol stove, for use in hard weather or in the emergency.

The chief article of equipment in this line is a combination oven and stove top made of what appears to be sheet iron, though the smoke of countless fires and the rust of many rains has given it somewhat of an individual look that makes it hard to tell what the original metal was. This stove like arrangement or oven—call it what you like, stands on three legs which may be pressed into the ground. Once this is set up in place a large stone is arranged behind the stove in such manner as to deflect the heat toward the top of the oven, a really simple little stunt once one gets the idea of it. If the camp is to be permanent—for a week or two—the stove is enclosed in two sides at least with stones which may be set in clay from a convenient brook, or leaned together in such manner that earth may be piled between the cracks.

It is always a good rule to build the camp fire at a distance from the woods if this is possible. A knoll near the edge of running water is desirable, although not essential. If a good sized rock with a high, flat side can be found, this makes an ideal location for the camp fire—other

things equally satisfactory.

If it is absolutely necessary to build the fire in the woods, it's a good plan—almost essential I should say—that the earth for a space of four or five feet in a circle around the fire be dug up so that danger from sparks is minimized.

The ideal way to build the camp fire is to take dead limbs and split them very fine with the camp axe. Then, after a fairly good sized pile has been made ready, take the clasp or sheath knife and whittle a brush of very fine shavings onto the end of several of the sticks. This done the brush ends made by whittling should be placed at the bottom of the pile and the fine split wood piled crosswise, or any way except (a manner frequently seen) paralleled to each other.

This latter method will give but a poor fire if indeed it will burn at all. It works well in a fireplace where there is a strong draught, but in the open air the opposite is true. The fire laid to your satisfaction the brush ends should be ignited and the rest is easy.

It isn't policy to make a big fire. In the first place the heat will be such that you will wonder which is cooking—yourself or whatever you may have on the fire. In the second place a big fire makes it a whole lot harder to cook good without burning, until the coals have died down, whereas with a very small fire you can start right in cooking over the flame, exactly as you would over a gas stove in the city.

I know one old trapper whom we met last summer who does all his cooking for months at a time over a fire that one could easily span with the outstretched fingers of one hand—I saw him make at least three of them. Think of that when you are tempted to build up a roaring big fire.

**Green wood won't burn.
Don't forget this.**

It'll make a fine smudge if put on to a fire with the intention of keeping the mosquitoes away, but as for making a fire over which to cook—impossible. There isn't any need of cutting standing wood anyway. Nearly always a few minutes search by the party in the surrounding woods or fields will uncover enough dead limbs, or seasoned timber that has died on the stump to make more fire than you will use and the handy axe man at the camp will have little difficulty in getting it ready for the fire.

In some manner or other it happened that our party was unusually handy at cooking and the whole four of us took turns at the job. A handy tin box of flour enabled us to make biscuits in the big oven—"powdered biscuits" they are called where I come from—and for a change we fried white meal cakes in the skillet.

Steaks, chops and occasionally fish (although the latter was preferred in another style) was cooked over an ingenious devised iron stake driven into the ground from which were suspended at right angles two broilers, one for the use mentioned and the other for making coffee. These gratings, or broilers, if you prefer the word, were adjustable to any height on the stake, simply by lifting them at right angles and then allow-

ing them to drop against the edge of the stake when at the desired height, their weight holding them in position against the edge of the upright.

The leader of our party, made cautious by years of camping experience, insisted that all water used for drinking purposes be boiled, and while this seemed at times a needless precaution, we followed it religiously, boiling the day's supply of water after breakfast before the fire was covered and hanging it up in the shade in a five-gallon water bag, which, through some principle of capillary action, with the details of which I am not familiar kept it deliciously cool and palatable. I don't believe in free publicity—especially in a story of this kind, but rest assured if I knew the name of the manufacturer who makes these water bags I'd tell you because surely they're a boon to the motor camper.

Utensils for cooking and for use about the camp should next claim the attention of the prospective camper. These need be few in number and preferably should include only those things necessary to the conduct of the culinary department of the camp. An axe of small size is absolutely essential. My uncle's outfit also included a large axe, but that isn't necessary strictly speaking, although it is handy enough at times—if one understands how to use it.

Two forks of iron with 10-inch handles should be included, and there should be two long handled spoons of similar material and length.

A flap-jack turner comes in handy, and there should be at least two large steel knives with wooden handles to take care of slicing meats, cutting up fish of larger size, slicing bread and ham—in short being put to a hundred and one uses around the camp.

A smaller knife to peel potatoes and do similar work should be packed along, and a short sheath knife or perhaps two for cleaning fish comes in handy.

If you have the portable oven such as has been described and I assure you that it is almost essential to your comfort, you will have need of only one "spider," or frying pan perhaps, although I should include two. Our outfit had three of varying sizes that nested one into the other. The handles were detachable as I remember it, or perhaps they folded into the body of the pans. They were handy enough I can tell you, although it infrequently happened that we had use for the three of them.

The proper kettle for all-round use—to make chowders, boil potatoes, heat dish water and in short take care of all camp work where a kettle is needed, should be of iron. A tin kettle will answer the purpose well enough, but once you have used an iron kettle you will want no other. This may be either a half gallon or gallon size, depending on the number of persons in the party. Ours held just three quarts and was plenty big enough—but not a bit too large at times when a delicious fish chowder made with milk, onions, salt pork, potatoes and freshly caught cat fish was in the making, and the same was true of the savory "mulligans" or beef stews that occasionally were cooked in that same kettle under the skilled hands of my aunt. I'll

say they were good.

Tin covers to fit the various utensils mentioned, together with a good sized aluminum coffee pot completes the list of necessary culinary goods, although there was no law against one taking all others that he may want. I suppose a Long Island society matron would have considered our table ware somewhat primitive and entirely lacking in variety, to say nothing of being limited. But it was sufficient for us. Too much of it sometimes when it was my turn to wash the dishes I remember.

We had first of all four tin or light iron plates. Then we each had knife, fork and spoon of the same material with black bone handles. Heavy tin cups were used holding a pint and the saucers were minus. Butter was served from an aluminum dish with a tight fitting cover which may be bought at any army goods store, and sugar (used mostly for cooking as we usually served coffee with condensed milk) was also kept in a similar container. Salt and pepper was served in a big shaker with two sections, each end of which held one of the condiments. This was used for cooking as well as at the table.

Our trip was outlined along somewhat different lines than those adopted by the usual motor camper.

We didn't stop once at a community or free motorist's camp, except for a few hours one day when we had the car tightened up all over by a very efficient repairman. This camp, if memory serves, was somewhere in the vicinity of Butler, Mo. The greater part of our journey was right out through the wilds of Missouri and Arkansas—wonderful country—and plenty of it—a majority of the time miles away from even a farm house, although frequently we passed through small towns en route to another camping spot. For this reason, because we were for the most part away from stores and other sources of food supply we took along a pretty heavy assortment of provisions. I have a list of just what we had at the start of the trip and as this was replenished from time to time we usually kept stocked up with the following:

Coffee, two pounds; tea (mixed), one pound; butter, five pounds; sugar, 10 pounds; salt, ½ pound; pepper, ½ pound; salt pork, five pounds; lard, two pounds; eggs, two dozen; ham, 10 pounds; bacon, 10 pounds; flour, 24 pounds; buckwheat, five pounds; white meal, 10-pound tin; saleratus, one-pound tin; baking powder, 1-pound tin; milk, 12 cans evaporated or condensed; potatoes, ½ bushel; hard crackers, six tins; corned beef, 10 tins; canned corn, six tins; canned peas, six tins; canned asparagus, six tins; canned peaches, six tins; canned beans, 12 tins; canned soups, 12 assorted; canned tomatoes, 10 tins; fancy cookies, 10 lbs. (in tins); sardines, 15 cans (small); canned tongue, six cans (large); maple syrup, one gallon tin; cheese, five pounds; pickles, six bottles; onions, five pounds; oatmeal, two packages.

OTHER ITEMS.

Soap, six bars; soap powder, six packages; tooth powder, one can; talcum powder, one can; gun powder, five pounds (for mosquito smudge); joss sticks, 10 packages; short length clothes line, 24 clothes pins, scrubbing board (small), short handled broom.

As a usual rule we pitched our camp in the vicinity of a stream, although there was one long to be remembered time when we stopped on the top of a hill, from which a fine view of a fair sized lake was to be had, each wood-surrounded bay of which sheltered innumerable small permanent camps.

Another time we camped at the top of a high, level plateau, the ascent to which used up a large amount of expensive fuel and called for a lot of what an English friend terms, "intermediate gear work," on the part of the engine—but it was well worth the effort at that.

I doubt much if many had ever reached the top of this mountain plain—certainly few tourists had been there—and everything was as primitive as though the world had only just been born. Birds of all kinds (or so it seemed) sang in the trees and bushes, and at night a deer with a tiny fawn came to the spring that bubbled out from beneath a large rock. We spilled about a cupful of salt close to the spring and the following night there were nearly a dozen deer there all anxious for a taste of the salt. It was here that we cut the bee tree (mentioned at the start of this story), that yielded nearly 45 pounds of "wild" honey. (I didn't find out just why they called it "wild" by the way. It seemed tame enough after the "mountain dew.")

It doesn't make so much difference where one camps so long as there is an abundance of water—wood for fuel and fairly well drained ground on which to pitch camp. This last is the most important since low lying, swampy places ostensibly will not do for the camping ground. Neither is high, lush grass conducive to pleasant camping. It is altogether too apt to harbor snakes of various and sundry kinds to say nothing of ants and other insects, including the festive wood-tick (who "takes his fun where he finds it") and to whom every day is Christmas.

The motor camper who starts on a trip and makes up his mind to be thoroughly in earnest about having a good time will experience little difficulty in getting a great deal of pleasure from the outing.

The automobile will furnish a lot of this.

Then there is the fishing, without which no trip would be a success.

Added to this one has a choice of several other sports and will do well to take them all in.

For one thing there is the swimming. Imagine as you read this the tingling pleasure of well-being consequent on a plunge into a clean mountain pool. Fresh, sparkling, sweet water that braces you and takes away that wearied feeling so effectively as to make you think it never

even existed.

Hiking and mountain climbing; another way in which to get right down close to nature is real recreation and the camera, even a small one, adds greatly to the enjoyment of the trip, the more especially when one keeps a diary of each day's fun, carefully copies it on the typewriter when arriving home and then pastes the sheets into a photograph album and illustrates each page with the snap shots. It gives one a confidential book, so to speak, of the trip—an individual volume that will prove a source of pleasure and entertainment when the long winter evenings come around. I kept one last year—along the line described and intend to make a more complete one this year.

Boating is out of the question on the motor camping trip except as one may hire row boats on occasion at the various stopping places. We did this, of course, but we also got a lot of fun when far from towns where real boats could be obtained by making rafts on which we went sailing. It sounds kiddish I know, but try it sometime—it's worth your attention—that is, if you like real strenuous fun and don't mind an occasional wetting.

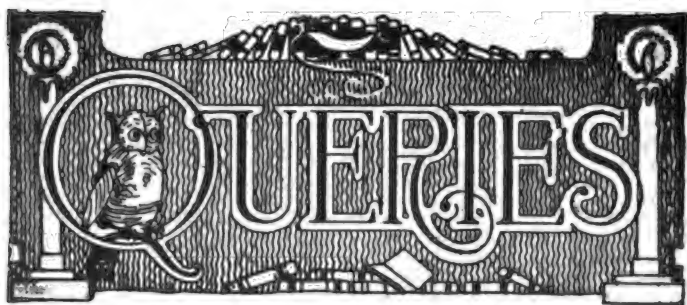
I'd like to go and tell you of the different places we visited on our trip, the things we saw and the adventures we had—but this article, originally started as a sort of intimate guide to those who contemplate motor camping has somehow stretched itself out until already it is over long.

I've told you how we prepared for the trip—what we wore—what food we took—how we arranged our camp—and while I haven't detailed each individual step, I believe you'll fill the gaps to suit yourselves—those of you who haven't yet experienced the joys of motor camping.

Therefore I've done all that was expected of me and I sincerely hope you'll have as good a time on your trip as I did last year—and shall be having while you read these lines. You've no idea what a groove you're getting into until you get away for a couple of weeks. It's like going to another country. It shows one, through the medium of contrasts, the vain hustle and bustle of all that is artificial in the world. It's an education just to lie on your back on a mountain top and gaze across the wide horizon. It gives you a feeling of second sight—a second sight that sees in imagination the futility of the smoking chimneys; the hurrying, money seeking crowds; the mad rush for food and the millions who pass on without ever having lived—without having known the intimate truths of life as expounded so truly by the silent places in God's great outdoors. Take the time properly to get in tune with things and see if I'm not right about this. I believe I am.

Denver's mountain parks system of 5,000 acres, located twelve miles from the city's boundaries, had 600,000 visitors last year.

Fossil specimens of huge reptiles that inhabited the shores of an inland sea where the Rockies now stand have been excavated in Dinosaur mountain near Denver.



FORD MAGNETO RECHARGING.

(N. A. G., Westerly, R. I.)

The magnets of my Ford generator seem to have lost their power. Would you please publish instructions for charging a Ford Magneto.

To recharge a Ford magento, it is first necessary to ascertain whether the magneto is in a proper position for remagnetizing. There are two ways of doing this. First: Get a small compass and hold it on a level with the insulated terminals on top of the transmission case. Hold the compass about one inch to the left of the imaginary line running through this binding post, parallel to the frame of the car, also holding it about five or six inches back from this binding post.

The engine then is turned over very slowly until the compass, held in this position, registers at a point about one inch to the left of this post. This means that the north seeking pole of the compass should point directly toward the front of the car; it is then ready to apply the current.

Just the minimum current necessary is not known, but very fine results have been obtained with 24 volts in the storage battery or from a generator up to 50 volts. Connect one end of this battery to the frame of the car and the other to the binding post of the magneto. Take care to break the contact formed on opening the circuit slowly and, also, make sure to disconnect the lights from the coil magneto terminal as they may be burned out from the high voltage used. Three to four seconds are enough to complete the operation.

GREASE CHANNEL WAS BLOCKED.

(C. A. M., Erie, Pa.)

Some of the channel ways on my car through which the grease should be forced to the spring pins are so completely blocked that it has become almost impossible to force the grease to these important bearings. Each time the car crosses any appreciable bump these spring pins emit disagreeable squeaks. In your opinion what is the quickest and easiest method to use in correcting these squeaks?

Very often when the grease hole from the cup becomes blocked the application of a hot wire to the hardened grease will free the passage readily. If you wish to eliminate the possibility of this condition occurring again, I would suggest that you install a high pressure oiling cup on each of the spring bushings.

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ALUMINUM PISTONS AND CARBON REMOVING.

(C. S. B., Syracuse, N. Y.)

My 1922 — has developed a severe knocking spell, which the garage man informs me is caused by the presence of carbon in the cylinders. He suggests I have this removed by burning it out with oxygen, which he claims is much cheaper than removing the cylinder heads. In your opinion is this practise of burning out the carbon with oxygen to be recommended?

In your case I would not recommend the using of the method suggested as the cylinders of your car are made of aluminum. The oxygen method should not be used for the removal of carbon deposits in engines with aluminum pistons because the steady application to the piston of the extreme heat generated by this process is very apt to prove injurious to the aluminum. In cars using cast iron or semi-steel pistons the burning method has given satisfactory results.

RUSTING RIMS.

(St. J. D., Los Angeles, Cal.)

It is very muddy country out here and rims of the cars rust very badly. I have ruined several tires in the last few years and have tried various methods to prevent this rusting, but to no avail.

While the usual mediums for preventing rusting of the rims are shellac and graphite, it is sometimes possible to use beeswax in this connection with unusually satisfactory results. The rims should be heated slightly with a blow-torch and the beeswax should be rubbed on while they are still warm.

TESTING IGNITION COIL.

(C. L. K., Newark, N. J.)

I am having trouble with the ignition coil of my car. Would you please advise me how to test a six-volt coil accurately to show its defects for not working perfectly?

The troubles most frequently encountered in ignition coils are condenser troubles or open or shorted primaries. A shorted primary is very rare, but an open primary frequently occurs. To test for shorted condenser, disconnect the condenser if the condenser is not inside of the coil. Connect the terminals leading to the condensers across 110 volt A. C. or D. C. with a lamp in series. If the lamp lights, the condenser is short circuited or broken down between layers. On systems using grounded ignition—that is, grounded primary windings and ignition coils, such as the Studebaker, Remy coil model 171-A—connect the post to which lead from the breaker is attached, marked "timer", and to base of coil for this test. If the primary winding has become grounded in the above type of coil, the lamps in this test will be lighted just as if the condenser were shortened.

However, if the breaker points are badly pitted and burned, this can be assumed as condenser trouble. On coils using insulated ignition, the primary wire not grounded, such as Velie Remy coil model 172-A, connect the center post marked timer switch to the outside post which has not the resistance unit connected to it. An open condenser shows itself by very severe arcing at the contact points.

In case a 110-volt D. C. is available, a capacity test can be made by connecting across condenser with the lamp in series, then disconnecting and bringing the condenser terminals together. If a good spark is obtained, the condenser is all right. A good ignition coil should produce a spark that would jump at least a 1/4 in. gap. Put the coil on test and see what it will do. If it produces a good spark and does not miss at all after a three or four-hour run—that is, after it is well heated, it may be considered a good coil and fit for service.

DISTRIBUTOR CAUSES ENGINE MISS.

(B. F. S., Portland, Ore.)

I have an early 1919 ——— eight which started bucking early last spring. I was planning to take a long tour and had this car overhauled. During the 2800 miles that I traveled, I never heard a whimper out of it. A short time ago it acted first like a gas stoppage. I took down the gas line, cleaned out the carburetor and vacuum system, but it did not do any good. The only way that it will pull is in low, or at a very fast second gear, but in high gear there is absolutely nothing doing. Then I thought maybe it was in the electric system, so I had new brushes put in, but to no avail. I would like you to advise me what is wrong.

Although you do not state whether the engine hits on eight cylinders or not, we presume that this is the case. There are two major causes for this sort of performance. First, determine the quality of spark by removing one or two of the spark plugs and holding them $\frac{1}{4}$ in. away from a ground when the engine is running. This should show a hot spark jumping a gap of $\frac{1}{4}$ in. If the spark will not jump this gap, it is an indication of either a broken down coil or condenser, providing the points are clean.

Also make sure that both banks are hitting, as many times operators of ——— cars complain of this same trouble when only one bank of cylinders is hitting. If the spark is adequate, then check up the spark timing with the circuit breaker or distributor in fully retarded position. The spark should occur just as the piston has started downward on the explosion stroke.

Measured on the flywheel, the points should just start to break when a mark approximately $1\frac{1}{2}$ in. past the upper dead center mark is in line with the pointer. To determine whether both banks are hitting have a second person sit on the running board and observe by opening the pet cocks whether all cylinders are firing when the engine is in high.

TIMING PAIGE SIX.

(I. E. P., Seattle, Wash.)

I am the owner of a Paige car which needs retiming. Would you please print explicit directions as to how the spark is timed on a Paige Six, 1916 model?

To set the spark on a 1916 Paige proceed as follows: Turn the engine over with the starting crank until the pointer or indicator on the crankcase arm comes directly in line with figures No. 1 and 6 dead center on the flywheel rim. This indicates that pistons No. 1 and 6 are at the extreme top of the stroke. By watching the opening and closing of the valves it will be found that as No. 6 exhaust valve is just closing No. 1 cylinder will be firing. Be sure that No. 1 cylinder is on the firing stroke.

Next remove the distributor cover from the magneto and turn the magneto armature until the carbon brush is in line with No. 1 terminal on the distributor cover. With No. 1 piston at top dead center or with the marks on the flywheel about an inch past the upper dead center mark, retard the breaker housing of the magneto to the full retard position.

With the points just about to break on the magneto, connect the couplings and the engine is timed. It is only necessary to connect the wires in their proper order of firing, which can be determined by looking at the valve cover plates.

TIMING BUICK VALVES.

(C. E. H., Meridan, Conn.)

Please advise me at what point the piston should be when the intake valve on a model 55 Buick starts to open the exhaust valve. The flywheel on this engine has been moved and the marks are not in the right place.

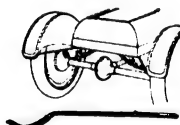
The timing on this engine is supplied by the factory in degrees of crankshaft rotation. To reduce degrees of crankshaft to inches of piston travel requires that two factors be known: The stroke in inches and the length of the connecting rod. We would suggest that you time this engine by the closing of the exhaust valve. The exhaust valve should close 11 degrees after upper dead center. This is approximately equivalent to 1-16 inch on the piston travel. With the piston set in this position, try to mesh the camshaft gear. If the gear will mesh without moving the piston more than 1-16 inch, the setting is correct.

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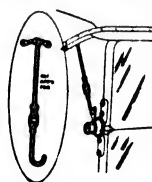
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WESTINGHOUSE CUT OUT.

(W. H. F., Los Angeles.)

Would you please publish an explanation of the action of a Westinghouse electric system cutout?

The Westinghouse relay cutout differs from most cutouts in that it has a regulating resistor and a compensating series and shunt coil. These compensating coils are used to limit the amount of current. The action is as follows: When the speed of the generator is such that the voltage produced is slightly in excess of the battery voltage, the regulator shunt coil operates to close the cutout contact point, thus permitting the generator to charge the battery. The regulating contact points do not become operative until the generator voltage is in excess of the required amount. These points are generally set to commence regulation at about 15 to 18 amperes.

When the voltage becomes excessively high, the series compensating coil begins to function. The flow of the current through this coil causes the regulating contact to open, thus forcing the current to flow through the regulating resistor. The resistance of this coil is sufficient to cause the generator voltage to drop to a low value when it is placed in series with the armature circuit. This is really a potential coil because it secures its flux from the voltage generated. If the regulation of the voltage were entirely dependent on the series coil, the regulation would be very poor. With the regulating resistor in series with the field of the generator, the drop in the voltage is considerable and as soon as the regulating contacts close, the voltage rapidly rises.

This is comparatively a slow process and requires considerable time. To overcome this slow action the regulator is fitted with a shunt compensating coil in conjunction with the series compensating coil. The current which flows through the shunt field of the generator amounts to not more than $\frac{1}{4}$ ampere. Any slight variation in the current impressed on the shunt field causes rather a wide variation in the voltage output of the generator. It is this small current that is used to assist the series compensating coil. Likened to a mechanical device, the series compensating coil performs the same function as the rapid adjustment of a feed screw, and the shunt compensating coil performs the function of very fine micrometer adjustment.

TEMPERATURE VERSUS PRESSURE.

(F. E. C., Portland, Me.)

Would you please answer the following query in your columns? What is the temperature of the mixture under compression in the automobile internal combustion engine at 60 and at 70 pounds gauge pressure?

This cannot be stated accurately, because it varies with the various designs. The average is from 700 to 1150 deg. absolute.

The ordinary thermometric scale is entirely arbitrary. The scale is graduated into equal parts of 180 of the distance between the freezing and boiling points. The Fahr. freezing point is 32 degrees and the boiling point is 212 degrees. In absolute temperature ratings, the zero is what would correspond to minus 461 degrees Fahr. If the absolute zero is fixed as minus 461 degrees and temperatures measured from this point, then the increase in volume of a perfect gas (the pressure remaining constant) will be directly proportional to the increase in the temperature of the gas, or if the volume remains constant the increase in pressure will be directly proportional to the increase in temperature. This relationship is known as 'Charles' law.

BUILDING DODGE SPEEDSTER.

(I. B. A., Salt Lake City, Utah.)

We are rebuilding a 1916 Dodge roadster for more speed. What timing of the valves would you suggest and what make of pistons and rings? Would counterbalances on the crankshaft help the engine any?

Unless you wish to grind off the heel of the cams to give a greater lift to the valves or purchase a new camshaft, we would recommend setting the camshaft one tooth ahead. Lightweight pistons of the constant clearance type for aluminum or lightweight cast iron pistons should be fitted. We know of no successful counterbalances for the Dodge crankshaft.

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